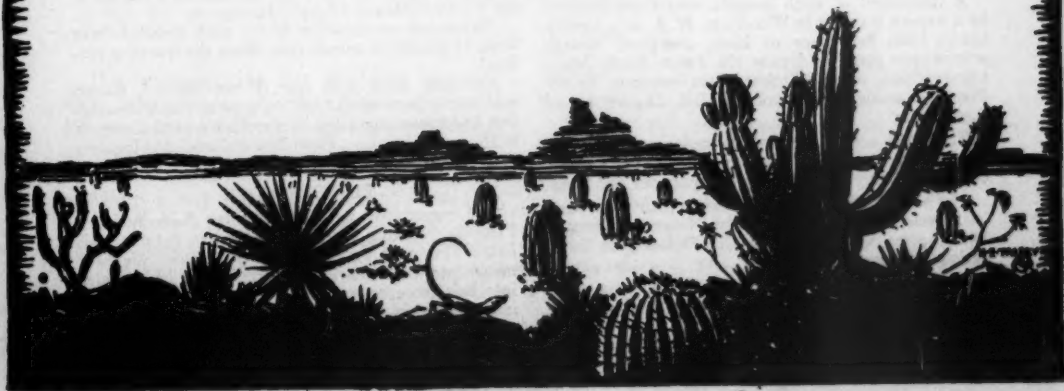


CACTUS AND SUCCULENT JOURNAL

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Fig. 31. Painting by Carl Spitzweg in 1850 shows the interest in cacti 100 years ago.



CACTUS AND SUCCULENT JOURNAL

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A fine crest of
MAMMILLARIA
PARKINSONII
in the Redler Collection,
West Hollywood, Calif.

YELLOW PERIL

A thimbleful of earth brought over from England by a woman residing in Woodbury, N. J., as a remembrance from her place of birth, contained enough microscopic pests to destroy the entire South Jersey tomato crops, it was disclosed here yesterday by the Plant Quarantine Division of the U. S. Department of Agriculture.

The pests are known to entomologists as golden nematodes, or round worms, which attack the roots of cultivated plants such as tomatoes, potatoes and beets.

The bit of earth around a tiny cactus plant was found in the woman's suitcase by Customs Inspector Emanuel Wirtschafter, when she arrived at Philadelphia International Airport.

The cactus plant and the earth encased in a small cellophane bag were turned over to J. A. Ramos, in-

spector in charge of the Plant Quarantine Division at the Customs House, 2d and Chestnut sts.

Microscopic examination of the earth revealed there were 11 golden nematode cysts about the size of a pin-head.

The cysts filled with eggs, if not isolated, Ramos said, could have spread and become not only destructive to tomato crops, but to the State's potato crop as well.

From The Philadelphia Inquirer
Sent in by Arthur B. Wells

EDITORS NOTE

We regret that we could not get John Rodger's *Cereusly Speaking* Notes transcribed in time for this issue. They will appear in the next issue. We have many carry-over articles that could not be crowded into this issue so we plan to mail the July-August issue earlier in July.

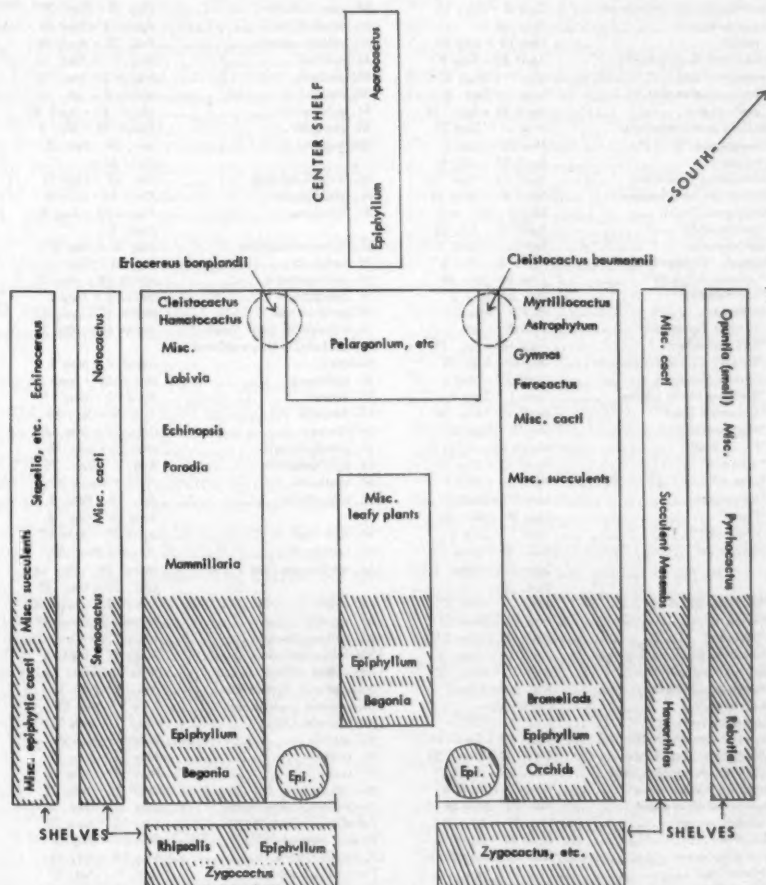


FIG. 32. Generalized diagram of arrangement of plants to take advantage of varying light conditions in the small greenhouse.

Flowering Cacti and Other Succulents

By IRVING G. REIMANN
Ann Arbor, Michigan

The accompanying list of 1958 blooming dates omits dozens of other plants which also bloomed. Numerous cacti were not listed because of uncertainty regarding their specific identity, and many of the other succulents because I did not keep a very complete record of them. The arrangement is alphabetical for the ready reference of those for whom this article is intended—the beginners. Question marks follow the names of plants which I identified myself. All others bear names as received from the dealers. A final

dash after a date indicates that the plant is still in bloom at the time of this writing.

Most of my collection is kept in an Orlyt greenhouse approximately fourteen feet square. A few plants, such as some of the larger pots of *Aloe*, cacti and *Euphorbia* for which I cannot find room are placed outside between last and first frosts and stored near windows in the attic for the winter. There are some five hundred plants in the greenhouse, on and under benches, on shelves and hanging from the roof. Although

<i>Acanthocalycium violaceum</i>	June 3 - Aug. 13	<i>M. campotricha</i>	May 13 - Oct. 29
<i>Aloe arborescens</i>	Dec. 24 -	<i>M. candida</i>	April 12 - May 19
<i>A. nobilis</i>	May 14 - July 20	<i>M. chionocephala</i>	Feb. 28 - April 24
<i>Aporocactus flagelliformis</i>	April 20 - May 9	<i>M. collinsii</i>	Aug. 11 - Oct. 16
<i>Astraphyllum asterias</i>	May 7 - Sept. 8	<i>M. dealbata</i>	March 2 - May 12
<i>A. capricorne senile</i>	May 1 - Sept. 6	<i>M. diaica</i>	March 8 - July 10
<i>A. myrtilloides</i>	April 16 - Sept. 26	<i>M. echinaria</i>	March 20 - April 30
<i>Aylastera pseudodeminuta</i>	May 14 - June 21	<i>M. elongata</i>	March 25 - May 2
<i>Chamaecereus "Flare"</i>	May 17 - July 2	<i>M. fragilis</i>	Jan. 14 - Feb. 2
<i>C. sylvestris</i>	April 29 - July 5		Dec. 27 -
<i>Cleistocactus boumanii</i>	April 25 - Nov. 12	<i>M. fragilis minima</i>	Feb. 21 - May 20
<i>Dalichothale longimamma</i>	April 27 - June 12	<i>M. gladiolata</i>	April 24 - June 6
<i>Echinocereus fitchii</i>	May 2 - May 6	<i>M. hahniana</i>	March 12 - May 9
<i>E. melanocentra</i>	April 21 - July 23		Nov. 5 -
<i>E. sarisophorus</i>	April 17 - June 3	<i>M. hahniana superba</i>	May 20 - May 29
<i>Echinopsis "Golden Dream"</i>	April 19 - May 6	<i>M. kawensis</i>	July 22 - Dec. 2
<i>E. "Johnson's hybrid"</i>	June 1 - June 20	<i>M. melanocentra</i>	March 18 - May 13
<i>E. "Los Angeles"</i>	May 5 - June 2	<i>M. mendeliana</i>	March 8 - May 2
<i>E. multiplex</i>	May 8 - May 21	<i>M. mercedensis</i>	March 10 - May 10
<i>E. "Orange Paramount"</i>	June 2 - Oct. 1	<i>M. microhelia (pink flowers)</i>	March 10 - May 2
<i>E. "Red Paramount"</i>	June 10 - Aug. 28	<i>M. microhelia (throw colored flowers)</i>	March 4 - May 9
<i>E. "Sunset"</i>	May 5 - Aug. 28	<i>M. multiceps</i>	March 20 - June 10
<i>Epiphyllum "Bambi"</i>	April 22 - May 3	<i>M. mystax</i>	April 13 - May 11
<i>E. "Baroness Marie Louise"</i>	June 1 - June 4	<i>M. perbella</i>	July 24 - July 26
<i>E. "Conway's giant"</i>	April 20 - May 24	<i>M. plumosa</i>	Dec. 17 - Dec. 22
<i>E. "Hermasima"</i>	May 5 - May 12	<i>M. pseudoperbella</i>	May 20 - May 28
<i>E. "H. S. Irwin"</i>	March 19 - April 3	<i>M. pyrrhocaphala</i>	Aug. 7 - Dec. 25
<i>E. "Johanna"</i>	April 15 - May 2	<i>M. soetigera</i>	April 3 - May 11
<i>E. "Latona"</i>	April 24 - May 1	<i>M. schiediana</i>	Jan. 19 - Feb. 2
<i>E. "Mauvette"</i>	May 19 - June 2		June 28 - Dec. 4
<i>E. "Padre"</i>	May 10 - May 13	<i>M. surculosa</i>	April 29 - June 10
<i>E. "Peacockii"</i>	June 1 - June 4	<i>M. tetracontha</i>	July 6 - Dec. 17
<i>E. "Poinsettia"</i>	April 28 - June 3	<i>M. werdermanniana</i>	March 26 - May 12
	Sept. 24 - Nov. 12		Oct. 30 - Dec. 16
	Dec. 30 -	<i>M. wildii</i>	March 22 - Aug. 20
<i>E. "Professor Ebert"</i>	May 17 - May 20	<i>M. woodii</i>	March 12 - May 10
<i>E. "Sunburst"</i>	May 12 - May 15	<i>M. zeilmanniana</i>	March 29 - Oct. 24
<i>E. "Viviana"</i>	April 28 - May 17	<i>Martinicereus nanus</i>	Aug. 19 - Sept. 8
<i>Epithelantha micraneris greggii</i>	April 15 - Aug. 8	<i>Mantvillea diffusa</i>	June 5 - Sept. 26
<i>Eriocereus bomplandi</i>	May 31 - Oct. 12	<i>Neoparteria nigritarida</i>	Jan. 4 - Feb. 16
<i>Escobaria strabilliformis</i>	May 31 - July 8	<i>Notocactus mammulosus</i>	May 9 - May 29
<i>Euphorbia hispid</i>	Continually	<i>N. submammulosus</i>	May 11 - May 27
<i>Foucaria (in variety)</i>	Oct. 11 ('57) -	<i>N. attonii</i>	May 9 - June 24
<i>Fenestraria rhopaphylla</i>	Sept. 22 - Dec. 1	<i>N. rutilans</i>	May 11 - May 16
<i>Glaetophyllum linguliforme</i>	Nov. 18 - Nov. 30	<i>N. scapo</i>	May 14 - May 15
<i>Groptopetalum paraguayense</i>	Dec. 26 - April 29	<i>N. tabularis</i>	April 29 - May 21
<i>Gymnocactus knuthianus</i>	Feb. 17 - April 4	<i>Nyctocereus serpentinus</i>	May 19 - Nov. 2
<i>Gymnocalyx andreae</i>	May 20 - May 28	<i>Parodia aureicentra (?)</i>	May 14 - June 22
<i>G. baldianum hyb.</i>	May 24 - July 19	<i>P. microperma (?)</i>	May 21 - Aug. 9
<i>G. bruchii</i>	April 13 - April 26	<i>P. singuliflora</i>	May 14 - July 16
<i>G. fleischerianum</i>	May 15 - May 26	<i>Piaranthus foetidus</i>	Oct. 1 - Oct. 27
<i>G. friedrichii</i>	May 16 - Nov. 20	<i>Pleasipilis boluili (large)</i>	July 16 - July 31
<i>G. leptanthum</i>	June 5 - Aug. 8	<i>P. boluili (small)</i>	Nov. 11 - Nov. 29
<i>G. michanovichii</i>	May 24 - Aug. 21	<i>Pyrrhocactus tuberculatus</i>	May 4 - May 19
<i>G. venturionum</i>	May 29 - July 3		Aug. 14 - Aug. 16
<i>Hamatocactus setipinus</i>	June 10 - Oct. 19	<i>Rebutia chrysacantha lutea</i>	May 9 - May 28
<i>Heliocereus speciosus</i>	May 17 - May 20	<i>R. miniscula</i>	March 7 - July 12
<i>Herrerao nellii</i>	March 21 - Sept. 20	<i>R. senilis</i>	May 11 - June 12
<i>Huernia keniensis</i>	May 25 - Dec. 24	<i>R. violaciflora</i>	Feb. 28 - May 10
<i>H. pilansii</i>	Nov. 6 - Dec. 20	<i>Rhipsalis mesembryanthemoides</i>	Nov. 24 - April 2
<i>H. zebrina</i>	Oct. 29 - Nov. 14	<i>Rocoea falcata</i>	July 11 - Aug. 18
<i>Kalanchoe mammosa</i>	July 7 - Oct. 30	<i>Schlumbergera "andreae"</i>	May 2 - May 27
<i>Kleinia radicans</i>	Oct. 18 - Dec. 4	<i>Senecio scopaeus</i>	Oct. 4 -
<i>Leuchtenbergia principis</i>	July 17 - July 20	<i>Setiichnopsis mirabilis</i>	May 2 - Aug. 14
	Aug. 27 - Aug. 30	<i>Stapelia gigantea</i>	Sept. 4 - Oct. 17
<i>Labisia aurea</i>	April 19 - Aug. 4	<i>S. hirsuta</i>	Aug. 21 - Nov. 20
<i>L. binghamiana</i>	May 10 - Aug. 13	<i>S. variegata</i>	July 16 - Oct. 20
<i>L. fasciculata</i>	June 3 - June 15	<i>Thelocactus bicolor</i>	May 8 - Aug. 30
<i>L. paucartambialis</i>	May 11 - Oct. 6	<i>T. goldii</i>	March 29 - May 13
<i>Lophophora williamsii</i>	June 18 - Sept. 18	<i>Titanopsis calceolarum</i>	Oct. 14 - Oct. 18
<i>Mammillaria albigensis</i>	April 19 - May 28		Dec. 6 -
<i>M. bocasana</i>	April 24 - May 5	<i>Zygocactus truncatus bicolor</i>	Nov. 11 - Dec. 22
<i>M. bocasana (?)</i>	April 12 - Aug. 24	<i>Zygocactus truncatus</i>	Dec. 27 ('58) -
<i>M. bogotensis</i>	March 31 - April 22	<i>(Christmas Cactus)</i>	Dec. 28 ('57) - Jan. 22
<i>M. bombycina</i>	Feb. 3 - April 13		
<i>M. braunsiana</i>	April 29 - May 6		
<i>M. calceolaria</i>	May 8 - Dec. 2		

FIG. 33. Blooming dates of some cacti and other succulents in a small greenhouse in Michigan in 1958. *Echinocereus sarisophorus* is erroneously listed above, and should read *E. pentastophus*.

cacti and succulents occupy most of the space, they share it with such plants as orchids, bromeliads, *Pelargonium* and *Begonia* in variety, *Azalea*, *Pentas*, *Jacobinia*, *Beloperone*, *Abutilon*, *Haemanthus*, *Clivia*, *Strelitzia*, *Hedychium*, etc., and at this time of year (January), *Cyclamen*, *Freesia*, *Sparaxis*, etc. Obviously I have problems in trying to provide suitable microclimates for this wide variety of plants in so little space. In general, preference as to temperature and exposure to light is given to the succulents. Eventually, as potting on and the acquisition of new plants make more demands on space, I shall have to most reluctantly eliminate most of the non-succulents unless I can afford a second greenhouse.

EXPOSURE TO LIGHT: The greenhouse is attached to the southeast wall of my garage, with the ridge thus extending to the southeast. The only entrance is through the garage, which leaves the full space of the other three walls for benches. Clear glass is used on the northeast wall and the southeast end. The roof and the southwest side have ribbed light-diffusing glass acquired with the greenhouse. The reason for the light-diffusing glass is because I had read, and had been told, that even cacti will sunburn under clear glass. I do not understand why this should be, but rather than risk my plants, or use unpleasant looking coatings since the house is visible from the road, I settled on the light diffusing glass. The xerophytes and other sun-loving plants are concentrated in the southeast half. Just beneath the last two sections of glass at the opposite end, I have stretched almost transparent plastic, except on the northeast side, to cut down the light intensity for the epiphytes and other sun-sensitive plants. As the plastic gradually became more and more opaque, I cut more and more inch-wide slits in it, so that now it gives the same effect as spaced laths. The taller leafy plants provide additional shade from the slanting rays of the sun for the smaller shade-loving plants at bench level.

It has taken some juggling around and experimentation to try to provide all of these plants with their optimum light requirements. Some probably getting their maximum may be next to others getting their minimum. Still, the foregoing list proves that many plants have sufficient tolerance to put on healthy growth and to bloom under the light conditions available to them here. Somehow, I can't help but wonder if some of the plants from sun-drenched deserts would benefit by full exposure to the summer sun through clear glass. Can anyone confirm this for me?

It would be very nice to be able to group all of one's plants strictly according to their botanical classification. Unfortunately, however, even

within the same genus there are often wide variations in requirements. *Mammillaria*, *Gymnocalycium* and *Rebutia*, three of the most popular genera, all include species with varying demands from much sun to part shade. My specimens of *Stenocactus* until this week have been in one of the sunniest spots I could provide, while all of my *Gymnos* were in what I consider to be half shade. Now, thanks to Professor Borg's book, "Cacti," which my wife gave me for Christmas, I have switched most of them, leaving in their original places only those *Gymnos* which prefer half shade. Although apparently not in the most favorable position, the *Gymnos* bloomed last year (1958), some profusely. Perhaps they will do even better this summer.

WINTER HEATING: Winter heating is provided by a natural gas-heated hot water system. An aluminum household-type water heater in the garage, set at 180° (its maximum), furnishes the heat. A thermostatically-operated pump circulates the hot water through a finned pipe beneath the benches. The tank is ignited when night temperatures drop below 50°. The thermostat controlling the pump is set at 55° in above freezing temperatures, 50° in temperatures down to 10° outside temperatures, and 45° for lower temperatures. I would prefer to keep the temperature in the greenhouse at 50° or above, not for the sake of the cacti or succulents which enjoy some winter coolness, but for the other plants. *Hedychium*, *Ixora*, *Cissus discolor*, *Crossandra* and a few others suffer from lower temperatures and would die, I believe, if they were not removed to the livingroom, where unfortunately there is not enough light or humidity for them to really prosper. Some of the orchids are pretty sad about it too. The obvious solutions are to stick to plants which prefer winter coolness, or to get another greenhouse. To my surprise the Rex begonias look good, even after one of the coldest Decembers on record.

The reason for cutting the thermostat down to 45° in zero weather is because the circulating pump runs constantly when higher temperature is demanded at that outside temperature, and the water, cooling swiftly in the radiator pipe, passes through the tank too rapidly to reach maximum heat. Consequently the desired temperature is not attained, and the pump runs constantly. With the thermostat set lower, the pump and the tank shut off from time to time, the water reaches maximum temperature, and the whole system operates more efficiently—and not to be ignored, more economically. We had more zero weather last December than we have had in any entire winter during our eleven years in Michigan. My gas bill, including all household use of gas, was \$12.16. Of this, about \$7.00

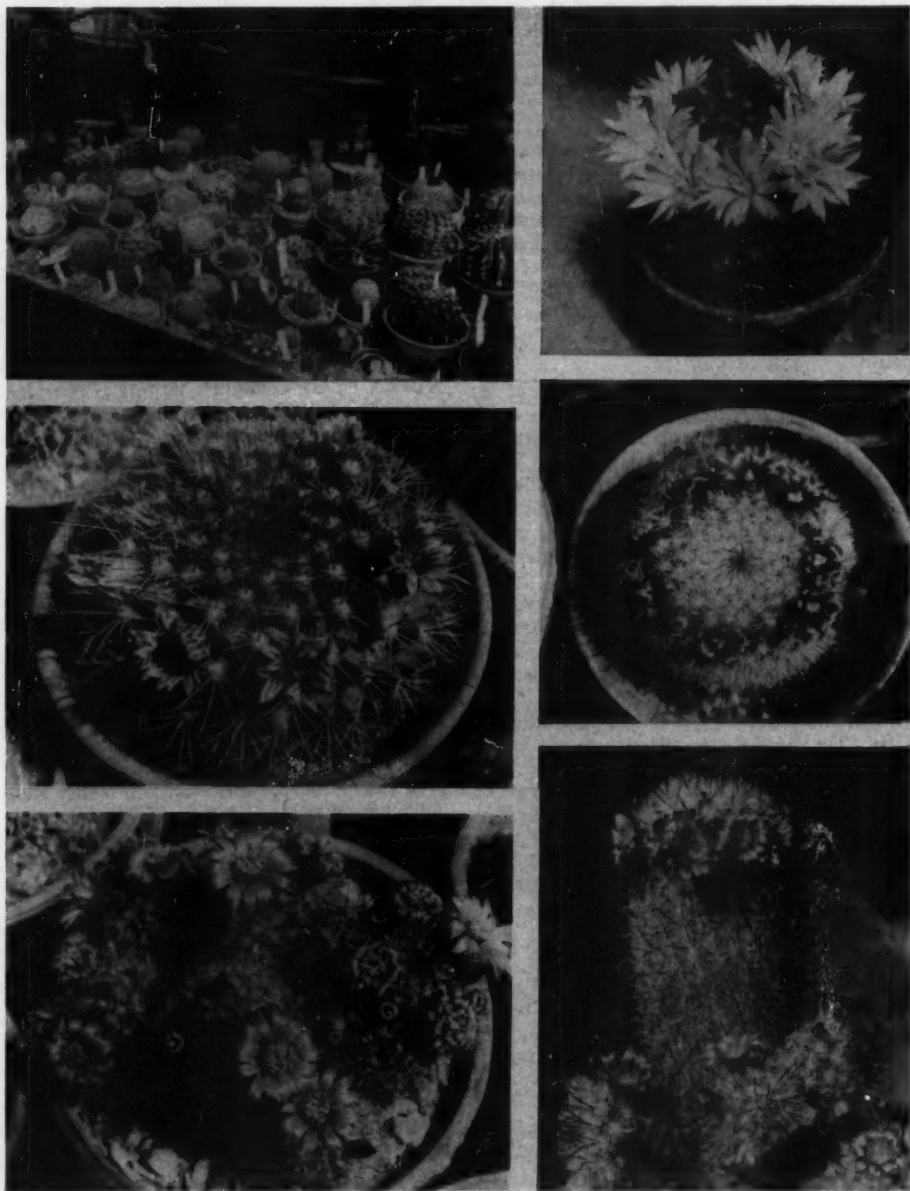


Fig. 34

Upper left, General view of one of the benches; upper right, *Dolichosteles longimamma*;
center left, *Mammillaria melanocentra*; center right, *M. mendeliana*; bottom left, *M. zeilmanniana*;
bottom right, *M. microbelia*.

represents the cost of heating the greenhouse in December.

One problem which arises in winter when no one is at home is caused by sunny days. During the short days it is still almost dark when we leave for work, and weather forecasts notwithstanding, we never know whether or not the day will be sunny. On cloudy days I can open the hand-controlled roof ventilator a little and matters take care of themselves. However, if the sun comes out, the greenhouse temperature may rise to 100°, and even the automatic ventilator does not help much if there is not a through draft. Naturally, the pump doesn't operate, and in zero weather even though they are insulated and there are four gallons of Prestone in the water, the pipes in the garage have frozen while the greenhouse thermometer read around 100°. This can be avoided, I discovered, by leaving the door between the greenhouse and the garage open to cool the greenhouse and warm the garage. But, how about the days which start cloudy and later become clear and sunny, and no one is at home to open the door? Is a thermostatically controlled door the only answer? There isn't enough room to move the hot water tank into the greenhouse, and while that would prevent freezing of the pipes, it wouldn't cool the greenhouse.

HUMIDITY AND BENCHING: No special effort is made to control humidity except for occasional mist spraying of the epiphytes during hot dry spells in the summer. Apparently under my cultural conditions there is normally enough humidity to keep the epiphytes going, and not enough to harm the xerophytes. I do not bench any of my plants in the sense that the pots are embedded in cinders, sand, vermiculite, or any other medium. By having the pots free standing they dry more quickly and thus discourage root rot, pot to pot travel of underground diseases and pests is minimized, and need for repotting is rather quickly and easily discovered. Plants in embedded pots send their roots through the drainage hole and may develop a luxuriant root system in the substratum. Repotting then often requires cutting away much of the root system in order to get the plant back into a reasonable size pot. Also, greenhouse humidity is considerably lower when the benches are not filled with damp material.

WATERING AND RESTING: All of my plants are watered individually by hand, rather than by hose, and a thorough watering job requires up to three hours time. While this is quite a chore, it gives an opportunity for individual attention to each plant. Judgment can be exercised and certain plants may be given more or less water as they may seem to require it. Mealy bug and other pests can be spotted and controlled before

getting out of hand, because every plant comes under scrutiny.

During hot, dry weather, I water my small plants in "full" sunlight daily, varying the schedule for larger pots according to the size of the pot and the plant it contains. *Echinopsis* gets more water, for instance, than *Ferocactus*. Since I use a very porous compost which dries out quickly, everything gets watered at least once a week when in active growth, except occasionally during long rainy spells. I used to set a large number of plants out of doors during summer, but lost many due to our occasional long rainy spells. I now stand few enough pots out that I can haul them into the garage for drying out when necessary, leaving the car in the driveway.

The watering and resting schedule for the xerophytic cacti has not been much of a problem. In general, I taper off the watering so that by late October, growth has stopped. Since the greenhouse is fairly humid, I give almost no water, except to very young plants in small pots, until March. Thus, I try to rest them during the shortest days, and encourage growth during the long days. The University of Michigan Botanical Garden begins to water around Christmas time. However, it operates its cactus house at a higher temperature than I do mine. Their plants come into bloom earlier and also go into their rest earlier.

A "rule of thumb," which I have read in several sources of information, is to begin to water (if you have not already begun) when flower buds show. This I used to do, since it makes sense, and then would wonder why on certain of my *Mammillarias*, the buds invariably disappeared. This was quite frustrating until I read in Marsden's *Mammillaria* volume, under cultural directions for many species—"do not water until buds are well-formed or growth will begin and the buds will be reabsorbed." This advice was given for such popular *Mammillarias* as *M. celsiana*, *M. decipiens*, *M. elegans*, *M. dealbata*, *M. hahniana* and *M. melanocentra*, as well as for many others. Of course, if they don't show signs of blooming, watering should begin gradually by April or May at the latest.

Epiphyllum and *Zygocactus* present a different problem and a different rhythm of growth. Before I had the greenhouse, I set them out under my oak tree and tried to keep them pretty moist all summer. In fall, for lack of a better place, I put them in the attic and withheld water in an effort to get them to rest during the winter. In spite of everything I tried, they would start growing, putting out weak, spindly shoots in the poor light. None bloomed, except my old faithful variety, *E. "poinsettia"*. Now I keep them somewhat dryish in the summer and encourage

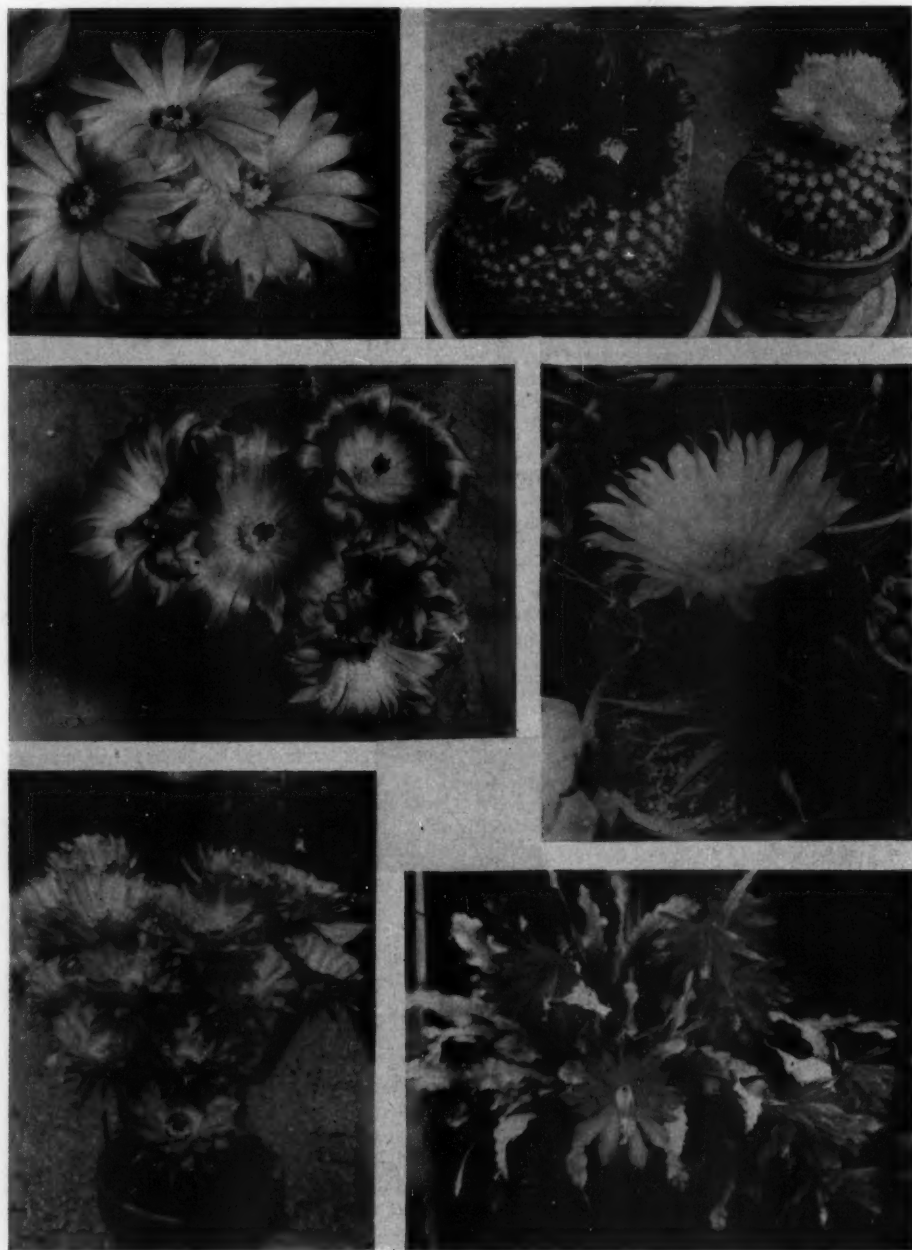


FIG. 35

Upper left, *Notocactus rutilans*; upper right, *Parodia sanguiniflora* and *P. aureicentra*; center left, *Echinocereus pentalophus*; center right, *Leuchtenbergia principis*; bottom left, *Echinopsis* 'Orange Paramount'; bottom right, *Epiphyllum* 'Poinsettia'.

their late fall growth. Magnificent blooms are the reward for pampering their urge to grow in the winter. I have read cultural directions which vary from "keep *Epiphyllums* constantly moist" to "occasional drying out is essential to their proper development." My results were most disappointing until I followed the latter advice. I am still frustrated by *Pseudorhipsalis macrantha*, which buds for me in the fall, but always blasts.

POTTING SOIL: The purpose of this article is to report on my growing methods, not to offer advice. If you are successfully growing and blooming cacti and succulents, don't change a single factor—no matter how different your system is from any other—unless you do so with spare or expendable plants, and with an attitude of experimentation. Never experiment with valuable or irreplaceable plants unless you have excellent reason to believe that it will be successful. My own earlier troubles were almost invariably due to root rot, or basal stem rot, caused by too heavy a compost and too much watering. While the long experience and expert practice of John E. C. Rodgers, author of the "Cereusly Speaking" column, has led him to use heavier composts, my own inexpert fumbling has led me into the opposite trend. I now use no "loam" or garden soil whatsoever in my composts. I adopted this practice, not only because of my earlier losses with loamy mixtures, but also as a result of sending for Mr. Johnson's notes on the sand culture of cacti and the University of California publication on "The U. C. System of Producing Healthy Container-Grown Plants."

In early 1957, I purchased some fine small plants of *Mammillaria bahniiana*, *M. mendeliana*, *M. mystax*, *M. woodsii*, *M. aljibensis* and *M. kewensis* from Mr. Gates, planted them in plain washed builder's sand and fertilized them, as directed by Mr. Johnson, with Plant-Chem-Salts, a complete nutrient composition developed for hydroponics. They bloomed in 1958 as reported in my list, and the first named two are presently (January) in bud. Mr. Johnson reports that this method of culture is particularly good for "difficult" plants like *M. plumosa* and *Mammilopsis senilis*, since it dries out very quickly.

The only two basic ingredients for the U. C. soil mix are washed sand and peat moss. A series of chemical fertilizers are recommended, some for adding to the original mix, others to be used in solution for subsequent fertilizing. The soil mixes vary from 100% sand to 100% peat. More than 300 pages are devoted to the discussion of the U. C. soil mixes, so it is quite impossible to discuss the subject very fully here.

I have become convinced that composted loam is not necessary. My basic potting mixture, which I prepare by the barrel, is 50% sand, and 50%

Michigan peat moss by volume. I use it "as is" for *Epiphyllum* and *Zygocactus*, adding (I chicken out, I guess) about $\frac{1}{2}$ shredded fir bark, some activated charcoal and vermiculite and about a tablespoon full of cottonseed meal per four inch pot. For most other cacti, I add about $\frac{1}{2}$ sand to the original mix, plus small amounts of powdered oystershell, rock phosphate, bone-meal, charcoal, and sometimes crushed granite for additional porosity, and oystershell chips (up to $\frac{1}{4}$) for plants preferring very limy soil. To doubly insure quick drying out for finicky xerophytes, I add up to $\frac{1}{2}$ of very coarse gravel.

For nearly all other succulents, I use a mixture of about $\frac{3}{4}$ washed builder's sand and $\frac{1}{4}$ Michigan peat, plus the supplements mentioned with the standard cactus compost. For bromeliads and terrestrial orchids, I use 25% sand, 25% peat and 50% shredded fir bark plus a little cottonseed meal. Nearly all the leafy plants are in a 50-50 sand-peat mixture plus vermiculite and supplements. For a little nitrogen to start with, I add some blood meal. When I don't forget, I add some tobacco dust to all mixes to discourage immigration of soil pests. All of the mixes described here are low in potash. To overcome this, the first couple of waterings include potassium sulphate, one teaspoon full to the gallon. After that, use of any normal balanced fertilizer seems to be adequate for the demands.

I prefer low nitrogen fertilizer for all succulents, and use the fertilizers weak and often during the growing season. To be sure that the plants get all of the elements they may require, my standard fertilizer is Plant-Chem-Salt. With this I alternate Plant Marvel (very high in phosphorus, which cacti love), and if on hand, occasionally also Rapid-Gro, Hyponex, etc.

If you wish to obtain some of the less widely sold ingredients such as cottonseed meal, blood meal, tobacco powder, etc., and can't find them locally, write to Goulard and Olena, Inc., Skillman, N. J.

Marsden, in his very instructive book, "Grow Cacti," lists twenty-five different compost formulas with eleven ingredients in different proportions for various genera of cacti. For a year or so I followed his recommendations as strictly as I could, with excellent results. However, I am equally pleased with the less complex system I now employ. I still use Marsden's table on page 52 of "Grow Cacti" as a guide for emphasis on factors such as limyness, sandyness, grittyness, etc., and vary the proportions of ingredients more or less accordingly.

Even Borg, after recommending various special soils for many different genera, concedes that "it is not rare to see cacti thriving very well in a mixture of two parts of sand or gravel to

one part of old leafmold, with just a little powdered old mortar to supply the small quantity of lime required for the growth of the plant and the proper development of the spines.

As a final word about soil, it may be helpful to understand that by itself, it is principally an anchoring medium. Water and elements necessary for plant growth can and must be added. Especially in the growth of succulents, air too is needed at the roots. The U. C. system referred to above is based on this concept, and the bulletin points out that plants in nature grow where they have to and very often will do better in a different soil than that of their natural environment. They may be growing where they are found because of other limiting factors such as temperature, rainfall, day length, light intensity, salinity, point of origin and other perhaps imponderable factors.

GIBBERELLIN: Much has been written in the past year or so about the plant hormone and growth stimulant, gibberellin. I thought I would try some on a few small plants to see if it would speed their growth or induce earlier flowering. I also tried it on some larger plants, such as my *Trichocereus spachianus*. As a result of this experiment, I can only warn against using it on a valued cactus! It left burned, now scabby, spots on the *Trichocereus*, several *Echinopsis*, and others. It caused some small *Echinopsis* offsets to grow upward so rapidly that they lost their globular shape and failed to develop spines at the areoles. Subsequent growth has been spiny and normal, but a spineless ring, scabby at the lower part, remains. Perhaps I held the spray too close, but the damage was done however it was caused. I also used gibberellin on a few other succulents with no observable effect except that the *Crassula teres* appears to have benefitted. My large *Echinopsis* "Orange Paramount" is developing some abnormality of the ribs at the summit, almost as though it might become cristate. At this writing, however, the method is not recommended to induce cristation unless you have expendable plants for experimentation. It would be most interesting if it worked.

BOOKS ON CACTI: Although I own a few popular books and serial publications on cacti and succulents, I cannot speak very authoritatively, because there are many which I have not seen. Limiting my remarks to those with which I am familiar, I have some general criticism to offer which I hope may be constructive enough to induce a few professionals to collaborate on a really useful cultural handbook. Most of the books I know give "rule of thumb" growing instructions, and then proceed at length to describe a great variety of plants, some of which would perish under the recommended care. Some au-

thors get carried away by the group of cacti which interest them most and go into extremely detailed descriptions while just brushing by others just as worthwhile. There seems to me to be quite a sufficiency of such general books and pamphlets available, most of them quite good and perfectly adequate for those who buy their cacti at the local greenhouses or five and ten-cent stores, which only carry easily cultivated species. But when we beginners get hold of the catalog of a large dealer, we get carried away by the descriptions and buy plants which will become giants, or which will take twenty years to bloom, or which rot upon the least excess moisture, or which sunburn if not shaded, or which will not bloom if not in full sunlight, or which must not be watered when in bud, or which need much lime, or which resent lime, or which must be kept cold in winter, or which require large or deep pots, or which prefer small or shallow pots, and so on, and so on. Small wonder that through our ignorance we destroy some of our choicest plants.

Mr. Johnson's beautiful catalogs have been of much help, but it is entirely impractical for a dealer to be able to give specific directions for *everything* he offers. It would be helpful to us, but complicated for him, to put the plants which become too large for the average home or small greenhouse in a separate section.

The cactus book most useful to me so far is J. Borg's "Cacti," 2nd edition. The only notable omission which has come to my attention is the lack of any indication of probable blooming periods, although he sometimes indicates that certain species are free flowering. For beginner and amateur use, an alphabetical rather than a taxonomic arrangement would save much time and index consulting. This virtue is among those of Marsden's "Mammillaria" volume, No. 2 of his cacticulture series. It would also be helpful if Borg's cultural hints were spread throughout the book and associated with the description of each genus, rather than divided between the first and last sections of the book (pages 34-36 and 444-454).

Marsden, already referred to, gives specific cultural directions (when known) for every species of *Mammillaria* which he lists. I am looking forward to his promised future volumes on other genera. In "The Cactus Book,"* A. D. Houghton tabulates more than a thousand species of cacti and indicates whether each is suitable for indoor growing, its country of origin, recommended exposure to sun, soil preference, moisture requirements, habit (but not size) of growth and color of flower (but not blooming

*Out of print since 1931

season). Published in 1930, the nomenclature is somewhat out-of-date, and the modern pesticides were unknown. But it is a good general little book, although of no help in identification. All of the books mentioned above would benefit from more illustrations.

My favorite book on other succulents is J. R. Brown's "Succulents for the Amateur," arranged and edited by Scott E. Haselton, the editor of this Journal. It is beautifully illustrated, well arranged and very informative. Still, it would help so much to know more about the resting seasons and light requirements for each species, or each genus when quite uniform. It can be expensive and frustrating to learn the hard way.

Apologies to authors whose books I have not seen or mentioned. Maybe your book is better than any of these, or maybe it's one I left out because it doesn't go beyond "rule of thumb" culture. No criticism of the general books is implied, because they serve their purpose admirably, and there are many good ones. But, what the slightly advanced beginners like me need is more information on the species which require other than routine care in order to get them to

thrive and bloom. Marsden is gradually getting the job done for cacti. I feel most encouraged by the appearance of Dr. Dodson's article in the January-February issue of the Journal (which arrived after completion of the foregoing), and his promise of more to come. The International Succulent Institute is to be highly complimented upon its interest in contributing to the successful culture of succulents by the amateur, and by making available rare and interesting plants not offered by dealers. Thanks to Dr. Dodson's article, I am going to abandon hit-or-miss fertilizing additives in my future potting mix, and have sent for the I. S. I. compounded chemical mixture as advertised in the Journal. This is another much appreciated service of the I. S. I.

I wish to acknowledge with thanks the assistance of Miss Barbara Gagnon of the University of Michigan Exhibit Museum, who typed the manuscript and drew the greenhouse plan, and Mr. Herbert Wienert of the University of Michigan Museum of Paleontology, who prepared black and white prints for the illustrations from my Super Anscochrome transparencies.

The Control and Elimination of Pathogens from I. S. I. Grown Plants

By J. W. DODSON

In an organization such as the International Succulent Institute, through which we are attempting to distribute succulent plants on a world wide basis, it would certainly be a disservice if we were to introduce pests and diseases as well. Therefore, one of our first considerations has been the handling of plants in such a manner as to eliminate, or at least control, to a substantial degree, these undesirable factors.

In the following article, whenever we refer to pathogens, we are referring to detrimental fungi, molds, viruses, bacteria and other such soil organisms, that may cause a disease in a plant. Whenever we refer to a parasite, we are referring to an organism that obtains its food supply from a plant and lives in or on the plant, such as Mealy Bug, Nematode, Borer, etc.

Most untreated soils contain a vast number of organisms. In fact, about one-tenth by weight of such soil is composed of algae, fungi, bacteria, microbes, etc. Not all of these are by any means injurious and many of them are, in fact, quite necessary for the growth of the plants, for example; the nitrogen fixing bacteria. Our problem then, is to control or eliminate the undesirable pathogens and to encourage the beneficial ones.

Quite a problem for you and me, who have to find things out the hard way and use whatever methods we may have at hand. Fortunately for us each group of this teeming population of our soil is in active competition with other groups for its existence. Some organisms live off of the remains of former soil populations, others live off of the by-products of other soil groups and many compete actively with the plants themselves for nourishment. Generally, it is only when one or more such groups, because of favored conditions (such as soil composition, moisture, temperature and light), are enabled to become dominant, that we experience trouble. For example; even beneficial organisms such as Nitrifying Bacteria, may produce an excess of nitrogen, that would be absorbed by plants, resulting in an abnormal growth of stem and leaf that would not only change the normal appearance of the plant but render it susceptible to unwanted parasites and pathogens.

The easiest way to control pathogens then, is to eliminate them to begin with, and to encourage such beneficial organisms as are wanted. As a start, the soil itself must not contain pathogens. The U. C. Type Soil Mix is an excellent sterile

medium, as there are only two sources, (sand and peat), that might be infested. If there is any doubt in regard to this, the mix may be sterilized by a number of methods such as steaming, baking, or chemically treating. One method we have used quite successfully, especially when the mix is to be stored, is to treat the mix with a formaldehyde solution. Commercial formaldehyde may be purchased from almost any drug store, and is usually rated as a 38% solution. We dilute this at the rate of 3 tablespoons to 1 cup of water and mix with 1 cubic foot (1 cement sack or 9 gallons) of soil mix. We have found that the mix must be damp to do any good as formaldehyde is ineffective when dry. We then store the mix in the sacks in which the sand or peat is received. Before using, however, we allow the mix to aerate by putting it in clean cardboard cartons, for from three or four days. It should not be stored near living quarters. We do not use this mix until all odor of formaldehyde has disappeared, as this treatment might adversely affect seed and seedlings.

Now that we have a fairly sterile soil the next step is not to re-contaminate it with unwanted organisms. The I.S.I. receives plants from many sources and from many countries. As a precaution, therefore, we first wash the entire newly received plant (including the roots) by immersing it in a detergent solution about the same strength as that used for washing dishes. The milder detergents are best. The plants or cuttings are then rinsed off under running water. Then, we carefully examine the plant, cutting off any broken parts or cutting out any visible rot. When dealing with rot, we sterilize our instruments by dipping them in a solution of 1 part of 38% formaldehyde to 18 parts of water. This formaldehyde solution we have found may be stored for several months in a pan or open mouth container if covered. The instruments should be wiped off (after dipping in the formaldehyde) with a kleenex or paper, as there is some evidence that the formaldehyde might damage plant tissue or prevent root formation where it comes in contact with the plant. The next step is to dip the entire plant or cutting in a solution of potassium permanganate. Potassium permanganate may be purchased from any drug store in crystalline form. We use $\frac{1}{4}$ teaspoon of crystals to 1 gallon of water. Potassium permanganate cannot be stored but must be made up fresh, as it loses its effectiveness within a few hours. We have to handle this carefully as it not only stains badly but if taken internally is a poison as well. While this step has a certain bactericidal effect, it may be skipped if a good washing and rinsing job is done. The next step and final one before planting is, we feel, the most important. We again dip the entire plant or cutting in a solution

as follows: to 1 gallon of water add 3 tablespoons of 50% Wettable *Captan*¹ and 2 tablespoons of *Fermate*.² (3 tablespoons of *Phaltan*³ if obtainable, may be used in place of *Fermate*.) (We also, when repotting from soil other than the U. C. Mix, dip the entire plant, including roots, in this solution.) These chemicals are the most effective that we have come across for controlling fungi such as the especially damaging strains of *Rhizoctonia*, also *Phytophthora*, *Pythium* and in some cases *Botrytis*. It is, of course, still possible to re-contaminate the plantings unless certain precautions are taken.

The most troublesome of the pathogens, at least under our growing conditions, are the various strains of *Rhizoctonia*. This pathogen is probably the most frequent cause of damping off of seedlings, decay of seed, stem rot of cuttings, and root rot of grown plants. This fungus often becomes a menace because succulent plants are naturally grown on the rather dry side, and the lack of water does not particularly inhibit it. On the other hand, the various water molds are greatly reduced by a lack of water. *Rhizoctonia* is usually recognized by a decay that starts near the soil surface. When an infected plant is removed from the soil, long strands of the fungus, to which dirt clings, may often be observed. It is long lived and survives drying but is not air-borne, therefore, infection occurs by introducing soil or other contaminated matter through splattering by water, soil particles carried over in flats or other containers, soil particles from tools, clothing, fingers and plant material, and from infested plants and seed. If this pathogen develops after planting we have found that 50% wettable *Phaltan* or *Captan* sprinkled on top of the soil helps as a control.

The only water mold of any consequence, in our experience, seems to mainly affect *Haworthia* and *Aloe*. This is probably a strain of *Botrytis*. We recognize this as a form of rot that starts from the top and works down, so that plants may literally "go to mush" and yet when removed, the stem and roots appear firm and sound. The attack usually starts from water drips or some leaf or stem injury. Growing the plants drier or warmer helps greatly. If the infected part is removed, the cut dusted with *Semesan*⁴ and thoroughly

¹Wettable 50% *Captan* "Ortho" brand by California Spray Chem. Corp.—Trichloromethylmercaptato.

²*Fermate*—"Ferbam Funicide" made by E. I. DuPont de Nemours Co.—Feric Dimethyldithiocarbamate. Obtainable from Nurseries or Garden Supply Companies.

³*Phaltan* "Ortho" brand. 50% Wettable, a new product by California Spray Chem. Corp. should prove very effective for *Rhizoctonia*. (The specific name is "trichloromethylthiophthalimide".)

⁴*Semesan*—by E. I. DuPont de Nemours—Hydroxy-mercurechlorophenol.

dried, the plant may sometimes be saved.

We have observed only one other pathogen of any consequence and that is the *Pythium* root rot of *Haworthia* and *Aloe*. Here the stem and such roots as remain, turn black and scabrous. Severe cuttings off of all parts is one remedy but care must be taken to remove all infected parts. The plant should then dry thoroughly (from three to four weeks) before planting. Placing the plant in hot water 115° for from 20 to 40 minutes, cooling and then planting is, however, the most effective cure in our experience.

Finally, the sterilizing of the containers, benches and greenhouse is also very important. If used clay pots are to be used, we soak them in water for about 24 hours to remove any accumulation of salts. Then they are scrubbed and baked (we bake them in our oven) for about ½ hour at 250°. When using flats, we clean them as thoroughly as possible and then paint them with Copper Naphthenate. We use a brand called *Copper-green*.⁵ This is a 10% solution and will usually take 2 coats the first time. If you can secure *Coppernate 250*⁶ brand, which is a 20% solution, it will require only one coat. This should be available at any building supply house. Copper Naphthenate will protect the treated surfaces from pathogens and parasites for a period of a year or more depending upon how much water it is subjected to.

Benches, shelves and any other wooden structures may be painted with Copper Naphthenate also. We note that many commercial growers today are making increased use of this product as a protection against many heretofore hard to eliminate organisms on flats and staging.

One word of caution, all of the chemicals mentioned are toxic in varying degrees and some are extremely poisonous. All should be handled carefully and in accordance with the manufacturers' instructions. If complete instructions are not given, consult the source from which you secured them.

All of this may seem to be a lot of trouble and unnecessary work, however, when we consider the cost to ourselves in time and money to secure and grow a plant in which we and others will find enjoyment, it is not too high a price to pay. It may also occur to us that in its natural habitat the plant did not receive any such careful treatment or care. This is quite true, but we overlook the fact that nature preserves a delicate balance between all of her subjects. Even so, when this balance is disturbed, it is possible for entire colonies of plants to die out. Another

thing that we often forget, is the hardships that many of the persons collecting these plants in the wild have experienced in securing them. Such hardships as heat and cold, hostile peoples, primitive transportation, insects and sickness are often encountered. Let me tell you of such an experience. Recently we received a collection of succulent plants from Ecuador. In the locality data, in regard to a particular collection of epiphytic cacti, the descriptive tag attached read: "From deep Amazonal Jungle of Jivaro Indian Territory. Epiphyte on gigantic tree. Attention: I cannot possibly obtain new material of this species should it be lost." The Jivario Indians as you know are head shrinkers of South America. We might report that the plant lived and looks like a new species that will one day be available through I.S.I.

In the next article I would like to discuss the measures that we use to control parasites and then, later on, something that we are working on, that we believe may prove to be as revolutionary as the U. C. Soil Mix and that is our experiences in growing plants in the new and modern plastic containers.

* * *

THE NEW YORK CACTUS AND SUCCULENT SOCIETY

The New York Cactus & Succulent Society has grown accustomed to winning prizes at the International Flower Show, but in this, our third year of participation in the show, we scored our most impressive triumph to date. In the Cacti and Succulents class, which calls for a display of 50 plants, we won our usual First Prize and in addition were awarded an International Flower Show Certificate and a Cultural Certificate. In this mammoth show, which occupied two entire floors in New York's gigantic showcase, the Coliseum, there were only five exhibitors who scored this triple victory. Our competitor in this class was one of our foremost plant growers whose excellent display next to ours helped create a magnificent cactus and succulent exhibit—the finest seen in years in any New York Flower Show. The crowd of spectators in front of this exhibit never seemed to thin out during the eight days the show was in progress. We had many large plants in our group but the plants that aroused the most comment were a *Parodia aureispina cristata* ("ooh—looks like a snake!"), a clustered *Rebutia minuscula* in full bloom, and a lovely *Noto-cactus haselbergii* with its gorgeous flower cluster on top that so obligingly remained open day and night for the full run of the show. Of the larger plants, an *Aloe plicatilis* was greatly admired for its graceful fan-like appearance, and a *Ferocactus covillei*, for its awesome armament.

In the Information Booth class we won Third Prize and a Special Prize in a field of 15 competitors. Our booth was just what it was meant to be—an information booth—so decoration was kept to a minimum. Against the back wall of the booth was a ten foot table on which we arranged about 50 plants with another 20 on the floor in front of the bench. Two hanging baskets attached to the wall cascaded sprays of *Sedum morganianum* and *Oscularia deltoidea*. On the front table we grouped our educational displays—a grafting exhibit, the most striking feature being a

⁵*Copper-green*—The Nascot Co., 1615 County Road, San Carlos, California.

⁶*Coppernate 250*—Gilbreath Chemical Co., San Francisco, California.

grafted *Aporocactus flagelliformis* in full bloom. A correct soil and potting display and a very fascinating group depicting propagation from seed and leaf cuttings completed the educational exhibit. Enclosing the booth on each side were the same two rustic fences, used in last year's show, set in planter boxes of hardy sedums and sempervivums. This never fails to attract many rock garden devotees.

We dispensed 2,000 cultural sheets on the general culture of cacti and succulents and an additional 2,000 sheets devoted just to Christmas Cacti. The Xmas cactus which we exhibited had just set buds and was beginning to bloom and so instead of the hundreds of blossoms it showed at last year's show it had just a handful this year. In a way, we were grateful because that riot of bloom at last year's show caused us no end of bother with literally thousands of visitors asking the same old question "it bloomed for my grandmother, why doesn't it bloom for me?" Since it was not so floriferous this year those queries were kept to a bearable level.

During the run of the show we accumulated a list of names of people who signified an interest in our society all of whom were invited to attend our 3rd

annual open meeting at the New York Botanical Gardens on April 12th. Bad weather kept the attendance down—it had been raining all morning and before the meeting had ended the rain had turned to snow. Dr. Barad delivered a very well prepared talk on propagation from seed which he illustrated with his own Kodachromes taken on visits to the Gates nurseries. This was followed by our monthly plant show which this month consisted of any plant grown from seed by members or any plant in bud or bloom. Next we conducted a sale of surplus plants donated by Arthur Garabrant and Dr. Barad. Several new members signed up at this meeting and our membership which stood at 44 at the beginning of the year has now risen to 60 paid up members! The May meeting will most likely bring a further increase. Our speaker for the May meeting is David Sprechman who will speak on his favorite subject—Lithops, illustrated with his own color slides. Incidentally, subscription to the Cactus Journal is a requisite for membership in our society since we feel that no one who is at all seriously interested in cacti and succulents should be without this fine publication.

JOSEPH EMMA, President

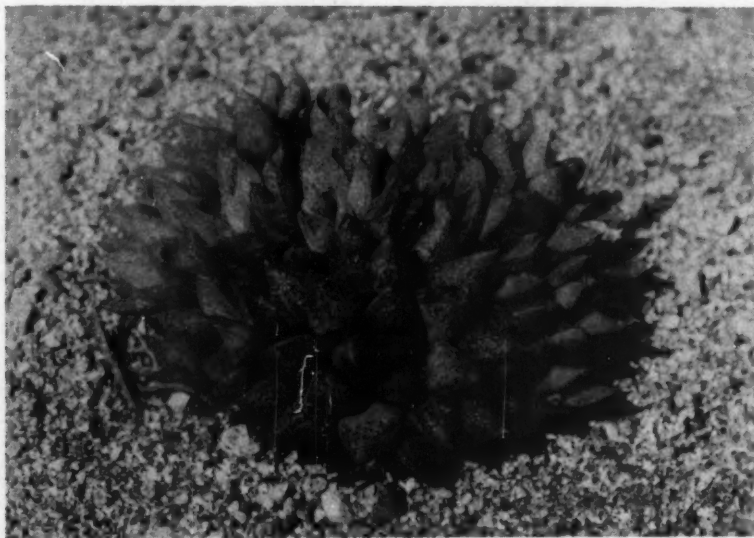


FIG. 36
Haworthia turgida var. *pallidifolia* G. G. Smith
nat. size

Notes on Haworthias

J. R. BROWN

Haworthia turgida var. *pallidifolia* G. G. Smith in Journ. So. Afr. Bot. XII (1946) 10, fig. 3 & Pl. II

Plant stemless, about 4 cm. diam., proliferous from the base and soon forming clusters.

Leaves erect-spreading, the young erect, smooth, to 27 mm. long, 10-12 mm. broad, 7 mm. thick

at base of end-area, obovate, deltoid-acute and terminating in a 1.5 mm. long, smooth, persistent awn, pale green; face below end-area more or less convex, with minute whitish, oblong flecks, light green; end-area 10-11 mm. long, 10-12 mm. broad, convex, light pellucid green, dull, with minute lengthwise oblong lighter to

silvery flecks, and 3 long lines, one of which reaches or nearly reaches the tip, and 3-4 shorter lines extending only slightly into the pellucid area, the lines distinctly reticulate; back of leaf convex, smooth, light green, dull, with many oblong pellucid spots and lengthwise oblong lighter flecks, and about 12 lengthwise reticulating lines, somewhat obliquely keeled in the upper part.

Locality: South Africa: Cape Province; Rivers-

dale Distr.

Named for the pale green color of the leaves, probably the palest green color of any plant in the sect. *Rethusae*.

Compared with the type this variety has a much paler green color, the leaves all over with distinct whitish flecks, has broader leaves, a longer end-awn and a duller appearance due to the numerous flecks on the end-area of the face of the leaf.

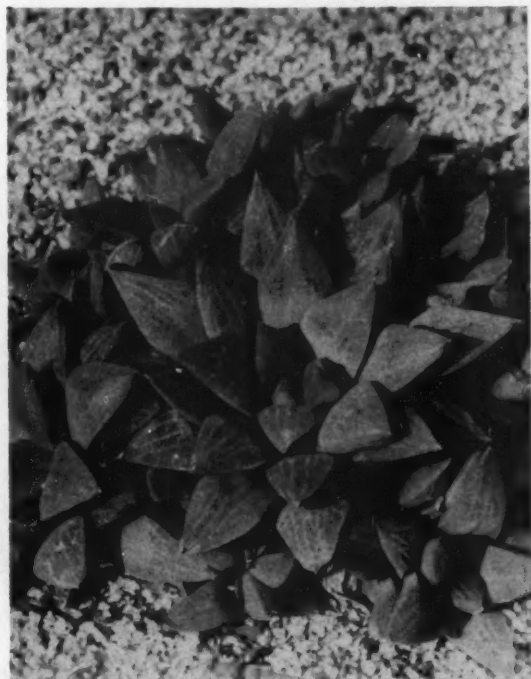


FIG. 37
Haworthia turgida var. *subtuberculata* Poelln.
nat. size

Haworthia turgida var. *subtuberculata* Poelln. in Repert. Sp. Nov. XLV (1938) 134. *Haw. cuspidata* Poelln. non Haw. in Repert. Sp. Nov. XLI (1937) 198, pro parte.

Plant stemless, about 6 cm. diam., proliferous from the base and soon forming clusters.

Leaves 2.5-3 cm. long, to 12 mm. broad, erect-spreading the younger more erect, bright green to dull green, obovate, deltoid, apex of leaves sometimes apiculate sometimes obtuse, end-area with numerous, minute, concolorous tubercles and with white to greenish-white flecks; back of leaf near tip usually with a few paler flecks, somewhat obliquely keeled; margins and keel usually serrately rough or with very minute teeth.

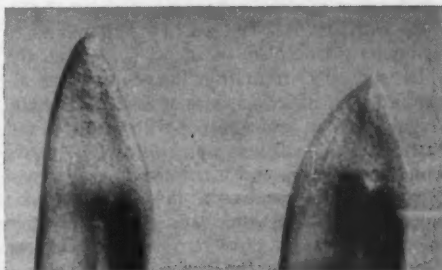


FIG. 38
Haworthia turgida var. *subtuberculata* Poelln. showing
end-areas of face of leaves somewhat enlarged.

Locality: South Africa: Cape Province; vicinity of Mossel Bay.

Dr. von Poellnitz (l.c.) described some plants under the name of *Haworthia cuspidata* Haw., later on realizing the mistaken identity he named them as varieties of *Haw. turgida*. One was the plant described and illustrated here the other was

var. *suberecta* which was illustrated in this Journal XIII (1941): 35.

Haw. turgida var. *subtuberculata* resembles var. *suberecta* in its more erect leaves but is distinct by the end-areas of the face of the leaves being roughened with minute tubercles.

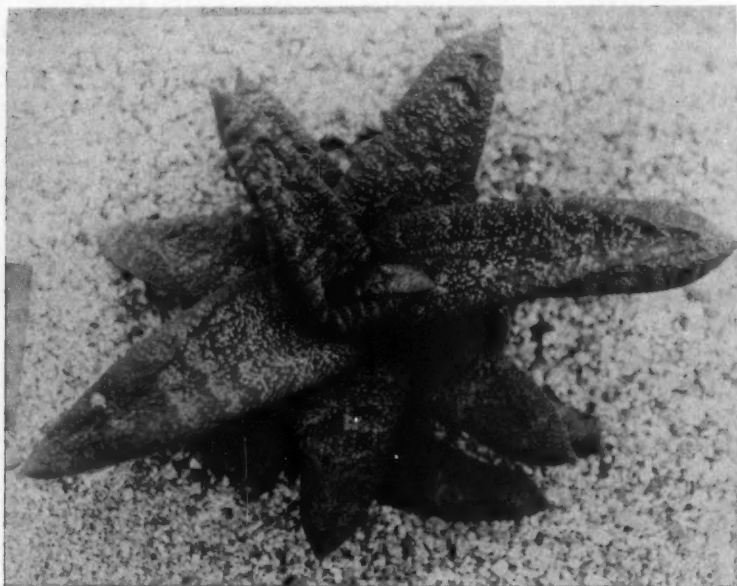


FIG. 39
Gasteria batesiana G. Rowley approx. $\times 0.75$

Gasteria batesiana G. Rowley in Nat. Cact. & Succ. Journ. X (1955) 32, figs.

This small *Gasteria* is one of the most interesting of the genus. The leaves, at first distichous, slowly become spirally arranged in a rosette which seems to attain a diameter of about 15 cm. when fully mature. The leaves are triangular to triangularly lanceolate in shape, spreading, the oldest somewhat recurving; the young leaves ascending; face of leaves more or less canaliculate, very dark green, and scabrous with tubercles and pustules; the small very numerous tubercles are white and shining and often arranged in broad irregular transverse bands, the more irregular pustules are larger and dark green, the same color as the leaf. In cross section the leaf is very obliquely triangular, the keel acute; the back of

the leaves are also densely covered with small white tubercles.

The shiny white tubercles against the very dark green leaves give this *Gasteria* a lively and sparkling appearance. It seems to take about 10 years for a small offset to reach flowering age. It flowers in So. California during April-May.

The plant shown in the illustration has several offsets at the base, the offsets have opposite leaves and it takes several years for a plant to assume rosette form.

In an interesting paper entitled "Gasteria—A problem genus of South African Succulent Plants" Dr. Schelpe, the author, mentions that *Gasteria batesiana* has been found in the wild state at Piet Retief in the Transvaal. This paper was published in Journ. Bot. Soc. So. Afr. part XLIV (1958) 20.

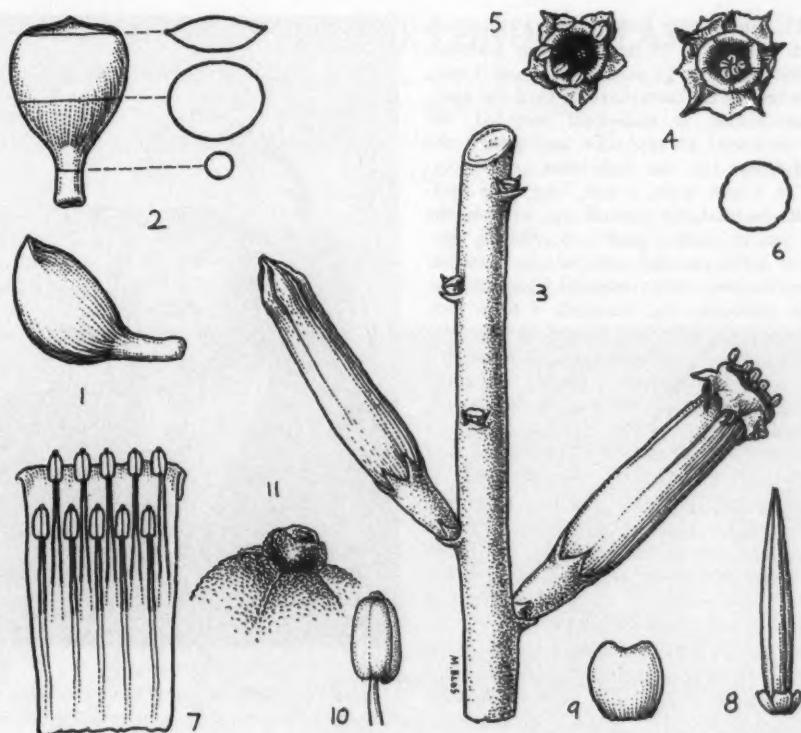


FIG. 40

Adromischus liebenbergii P. C. Hutchison, U.C.B.G. 56.076-2. 1. Leaf, side view. 2. Leaf, top view and cross-sections. 3. Flower and bud. 4. Perianth-limb, expanded. 5. Perianth-limb, reflexed. 6. Cross-section of perianth-tube at midpoint. 7. Stamen insertion. 8. Carpel. 9. Nectary-scale. 10. Anther. 11. Anther apex. 1-2, natural size. 3-8, $\times 3$. 9-10, $\times 9$. 11, greatly enlarged. Drawing by Mrs. M. Blos, 1958.

Icones Plantarum Succulentarum

14. *Adromischus liebenbergii* P. C. Hutchison¹

By P. C. HUTCHISON

In 1956 I received from L. C. C. Liebenberg three plants of the new species described below, a distinctive and attractive dwarf succulent of easy culture. Two of the plants flowered for the first time in 1958. The species promises to be a worthwhile addition to collections of succulent plants.

Adromischus liebenbergii P. C. Hutchison, sp. nov. Planta usque ad 6 cm. alta; folia cuneata petiolata, petiolo 1 cm. longo, pallide brunnescenti-viridia ceracea, lamina 2 cm. longa lataque, 1.4 cm. crassa, obtuso apice ipso acuto,

margine brunneo-flavescente; lobi corollae cuspidati connati incarnati; antherae globulis duplicibus terminalibus praeditae.

Roots fibrous. Stem erect, up to 6 cm. tall. Leaves alternate, erect to spreading, cuneate with a petiole up to 1 cm. long and 4 mm. in diameter, unspotted, pale tannish green with a coating of wax, the blade up to 2 cm. long and wide and 1.4 cm. thick, the apex blunt with a dull point and a tan margin, the cross-sections at all points symmetrical. Inflorescence simple; peduncle tannish green, glaucous below, up to 30 cm. long, 2 to 3 mm. in diameter for most of its length; rachis 10 to 15 cm. long; flowers

¹University of California Botanical Garden (Berkeley) Contribution Number 154.

15 to 25, solitary, the lower about 1 cm. apart, suberect. *Pedicels* 2 to 3 mm. long, greenish. *Perianth-tube* 13 to 14 mm. long, about 3 mm. in diameter, barely constricted toward the apex, the cross-section at mid-point rounded, the sinuses indented to mid-tube and green, the tube otherwise tan, the limb-lobes united, cuspidate, ca. 3 mm. wide, 2 mm. long, pale whitish pink, the margins pleated and whitish, the central portion darker pink and reflexed, epapillose as is the greenish tube interior. *Stamens* biseriate, the two series inserted about 2 mm. apart in mid-tube, the filaments 4 to 6 mm. long, the upper series the longer and broader below; 5 anthers barely exerted, whitish, the terminal globule translucent, double, unstalked or shortly-stalked, the lower globule roughened, the upper smaller, smooth. *Carpels* 11 to 13 mm. long. *Nectary-scales* 1+ mm. long and wide, emarginate, white, the sides rounded.

South Africa, Laingsburg Div., from the farm Varsbokkraal, near Laingsburg, growing with *Crassula rupestris* on the rocky, stony side of Witteberg Mountain, leg. L. C. C. Liebenberg 6186, *University of California Botanical Garden* 56.076-2 (BOL-Holotype).

At the Bolus Herbarium there is an excellent watercolor drawing of this species, without locality data, but labeled "Cook Whitehill 1737/22, 21 Feb. 1930." There is no specimen of this collection in the herbarium material I have examined from that institution.

Bryan Makin, of Alperston, England, informs me that the species is cultivated in England under the epithet "turgidus." No such name has appeared in the literature on this genus.

Adromischus liebenbergii is another new species² of the assemblage related to *A. hemisphaericus* (L.) Lem. and the first species of this affinity with a distinctly petioled, cuneate leaf. Similar, but not identical leaf-shapes are found in some specimens of *A. cooperi* (Bak. f.) Berg., and in undescribed material related to *A. maculatus* (Salm-Dyck) Lem.; however, all of these have larger leaves which are spotted and entirely different flowers with the perianth segments free. The double globule on the apex of the anthers in *A. liebenbergii* seems to be unique in the genus. On living plants of the clonotype this globule was unstalked; on a second plant it was shortly stalked.

Louis Christiaan Cronje Liebenberg was born on a farm in the Piquetberg District of Cape Province on 11 March, 1900. His parents

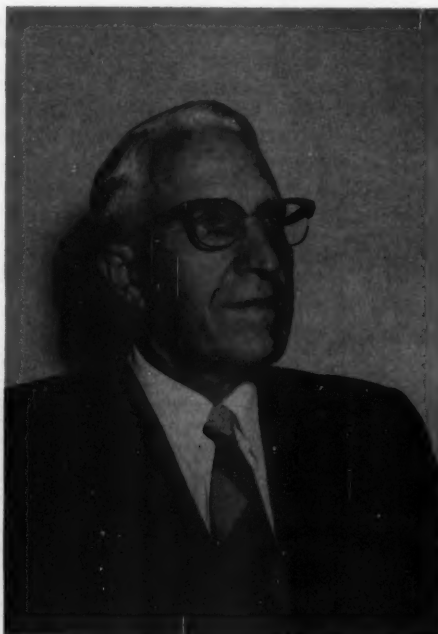


FIG. 41

Louis C. C. Liebenberg, Agronomist with the South African Department of Agriculture and a collector of cacti and other succulents. His collecting work has materially advanced the knowledge of South African succulents. Photograph taken in 1958.

moved into the Transvaal in 1912, where they settled down on a farm. Graduating as an agronomist at the Transvaal University College, Pretoria, he went overseas, studying plant breeding at Macdonald College, Canada, and tropical agriculture in Trinidad. After working overseas for several years, he joined the Department of Agriculture in his home country where, after a short period of service in the National Herbarium, he has engaged in pasture work until the present time.

Mr. Liebenberg, who now resides in Brooklyn, Pretoria, has provided extensive living material from most of the recorded localities of the Transvaal species of *Adromischus*, and through his own collection and his many contacts has obtained and forwarded living plants which greatly extended known ranges, clarified the application of older names, and aided greatly in the study of variation in some species of this genus. In 1955 he made extensive collections of the genus in Cape Province, and the present species is one of these.

²Cf. *Adromischus bicolor* Hutchis., Cact. & Succ. Jour. Amer. 29: 26-28, 1957.

DESERT FLOWERS UNDER GLASS

The story of my experiences and delight in growing and flowering Cacti and Succulents in a small glasshouse in Christchurch, New Zealand

By MARJORIE E. SHIELDS

CHAPTER 12

Look up now to the shelf above — "The Beautiful Shelf", where are more plants with beautiful leaves. These are the colourful Sedums, found in many parts of the world, but

those most suitable for glasshouse culture usually come from Mexico. Glass protection and full sun are necessary to bring out the lovely colourings and to flower them, but some prefer



FIG. 42

Top left, *Graptopetalum paraguayensis*. Top right, *Sedum treleasei*. Lower left, *Sedum nussbaumeri*. Center right, *S. allantooides*. Lower right, *Graptopetalum amethystinum* x *Sedum nussbaumeri*.

cooler conditions as we shall see. Keeping them quite dry in winter also helps to colour them. Perhaps it is not quite correct to say it is a shelf of Sedums, for we will also find Graptopetalums and Pachyphytums amongst them.

Graptopetalum paraguayense—the "Painted Leaf" of Paraguay occupies the central position and is usually the first to flower in spring, with quite attractive sprays of cream flowers. The individual blossoms have cream petals surrounding a central red seed case; each petal with two red lines outlining a cavity at the tip. In the centre of this cavity is a bright red spot and if the petal is moved slightly it will be seen the red spot is not attached to the petal at all, but is a stamen! Strangely enough the rest of the stamens are cream. The leaves forming the rosette are so perfect they seem carved out of pinkish grey marble. Graptopetalum amethystinum's flowers are still folded in bud, we will see them later.

Here is another plant very like G. paraguayense but even more beautiful, as the rosettes are shorter, fatter and more compact. Isn't it a wonderful colour? Soft pink, mottled with very pale green and suffused with yellow. The flowers too are yellow—yellow Graptopetalum flowers—complete with red spotting on the petal tips, making this plant look so gay. There is no doubt this is a Graptopetalum hybrid. But what was the other parent who gave it the yellow flower? On the end of the shelf where it shows to advantage is another hybrid, and one of the most colourful plants in the glasshouse. This is a beautiful pink, yellow flushed and with sprays of yellow flowers identical to the other hybrid and it would appear they both had one parent the same.

But for the other parent this one surely had Sedum nussbaumeri*, for except for the colouring the leaves are very much the same shape, being longish and pointed at both ends and this would account for the yellow flush. Here is S. nussbaumeri itself—a gorgeous golden yellow plant with clusters of pale cream flowers that seem as though they have been modelled from wax. They look so pure as to be almost unreal and remind me of artificial orange blossom, having the same waxy appearance, but of course quite differently shaped, as these are typical Sedum stars with stamens as long or even longer than the petals.

Sedum treleasei has bright yellow flowers—sprays of them looking very gay against the powdered blue jelly-bean-like foliage. Could this have been the missing parent with its yellow flowers? Sedum adolphii is very like S. nussbaumeri except the leaves are not as golden

*Sedum nussbaumerianum

in colour and are broader. The flower is a paler cream too — a good plant but lacking the brighter colour of the other. Then there is S. allantoides with almost white long jelly-bean-like leaves and sprays of white star-like flowers, each petal tip flushed with red, very dainty and delicate. Its name means "like a sausage"!!

One with a very different appearance and manner of growth is S. eichlamii. This plant dies down after flowering; small rosettes then form around the base of the old flowering stem, these eventually losing their rosette form as they elongate, reaching a height of about 8 inches. Little cream flowers appear on the top half of the stem from the axil of the leaves, which decrease in size as they ascend the stem. In winter the stems turn a brilliant maroon red and the leaves colour beautifully. A very interesting Sedum.

Here are the two that are not Sedums but Pachyphytums. There was no room for them with the others but with their glorious colourings they are quite at home here. P. brevifolium "with short leaves", bluish in colour are tipped and flushed with pink, while the branches look like glass, being covered with a shiny, sticky substance. The long flower stems are bright cerise and the calyx, which is the same lovely blue as the leaves, tightly clasps the brilliant cerise flowers. These are inclined to droop rather like P. oviferum, but as the flower heads are not as heavy they can be held more erect. The whole plant is a glorious piece of colouring.

The other Pachyphytum is beautiful P. amethystinum (not to be confused with Graptopetalum amethystinum). Each rosette looks like a lovely mauve-pink flower. The leaves are longish, thick, almost cylindrical, flattened slightly, and very delicate in texture. The flowers and the stems are the same lovely colour as the leaves, but the insides of the petals are brushed with a deeper pink. The name means "violet or amethyst-coloured" and is most appropriate.

Apart from Graptopetalum amethystinum the only other plant on this shelf is Sedum prealtum cristata. This will not flower as it is kept small. The flattened stem and the hundreds of tiny green leaves which cover it are brightly tinted with yellow and edged with pink. Only a common plant but its lovely colouring gives it a right to a home here. The whole shelf is a feast of exquisite colour; the nearest approach to it is the wonderful soft colourings seen in "Poole" china, and strangely enough many of the plants and the china appear to have the same soft texture.

Now we will have another look at Graptopetalum amethystinum to see if the buds have



FIG. 43

Top left, *Sedum adolphii*. Top right, *Pachyphytum brevifolium*. Left center, *P. amethystinum*. Right center, *Pachyphytum brevifolium*. Bottom left, *Graptopetalum* hybrid. Bottom right, *G. amethystinum*.

unfolded. Why look! The flowers are yellow! Does that solve the mystery of the other parent of the hybrids? I am inclined to think so. These

leaves are short, flattened cylindrical and as its name suggests beautifully coloured.

To be continued

Uses for Xerophytic Plants

MRS. JOSEPH G. KRES

"CHEMISTS EYE ARID-LAND PLANTS" the headline read. This was in a recent edition of the San Antonio Express. Our interest aroused, we read the story about a report delivered by Mr. Robert R. Cruse, Associate Industrial Chemist at the Southwest Research Center, to the 14th Regional Southwest Conference of the American Chemical Society, meeting in San Antonio.

The newspaper story was necessarily sketchy, and so my husband and I met with Mr. Cruse for further elaboration on the points he had made. After answering our many questions, he presented us with a copy of his report, entitled "Recent Highlights in the Cremergy of Xerophytic Plants".

The report had been presented to the Panel on Chemical Industry and Opportunities in Mexico and the Southwest United States. This Panel was chosen for presentation of Mr. Cruse's report since a considerable amount of basic research has already been done, and the immediate task is to convince industry that an untapped lucrative field lies before it. Mr. Cruse has made a prolonged study of the economic possibilities of the desert plants which grow in the Southwest United States and in Mexico.

Mr. Cruse, in his report, has made use of sub-heads to indicate the wealth of uses to which xerophytic plants can be economically put. In trying to give a brief recapitulation of the report I will follow the same procedure.

A—PHARMACEUTICALS

1. Steroids: Certain Yuccas and Agaves have been shown to be a plentiful source of the steroids from which cortisone is derived. At the present time, cortisone is of particular interest to biologists because of its relief of arthritis, but further work is currently being done in the field of cancer therapeutics. It has already been established that Yucca roots inhibit tumor growth without affecting embryo growth.

2. Alkaloids: Cacti, notably the Cerei and *Opuntia vulgaris*, contain alkaloids which have been used successfully in the treatment of mental disorders. These mescaline alkaloids have been shown to be non-habit forming, eliminating any possibility of addiction as is the case with morphine and its derivatives. There is also reason to believe, on the basis of experiments carried out in an anti-malarial screening program, that an anti-malarial potential resides in the cactus alkaloids.

3. Miscellaneous Drugs: *Opuntias* contain an anti-diabetic factor. An extract derived from the pads of the plant has the advantage over insulin that it can be taken orally, and has the further

advantage over "Orinase" a newly-developed United States oral anti-diabetic, that no ill after-effects occur, as has been the case with Orinase. Work currently being done with *Agave leucheguilla* holds out the promise of an effective medication for tuberculosis. This, however, is not established.

B—SUGAR AND STARCHES

Honey mesquite has been utilized as a source of invert sugar, the stalks being crushed in an inert atmosphere, and the tannins present precipitated with lime. An xerophytic shrub (*Stevia ribaudiana* Bertoni), indigenous to Paraguay, produces an extractive 300 times as sweet as sucrose, and does not have the bitter after-taste caused by saccharin.

C—FOODS AND FOOD PRODUCTS

Agave vera cruz produces a syrup with a fructose content similar to honey. In this respect, note that cacti, mesquite, yucca, and practically every other species of xerophytic vegetation furnishes raw material for honey bees. (Mr. Cruse, a native of Arizona, points out that honey derived from the ripened and split-open fruit of *Carnegie gigantea* is most unusual. The honey is wine-red in color, and has a tang, rather than the excessive sweetness of ordinary honey.) Both the young pads—Nopalitos—and the fruit of *Opuntia* are, of course, well known as foods. (Refer to the article in the Journal of July-August 1958: "Cactus Apples for Market".) Aguamiel, pulque, and tequila have long been known as drinks derived from Agaves; however, a delicious soft drink is obtained from the water extract of the pulp of different kinds of cactus fruit.

D—RESINS AND GUMS

Mucilaginous extracts of cacti can be used in water treatment, and are also effective as a flocculating agent in the mineral-dressing industry. (This last-named use is made by the Silverbell Unit of the American Smelting and Refining Co. in their copper beneficiation procedures.) A water conditioner is currently on the market in Mexico which contains extractives from Agaves, similar to those in *Opuntias*; this conditioner is utilized as a cleanser, rust inhibitor, boiler water conditioner, detergent, and protective coating.

E—FIBERS

Yuccas and Agaves have long been used for fiber purposes, and this utilization continues. Further experimental work is being carried on on the processing of the fiber and on the development of machinery for separating the fibers and pulp. Also, when fine asbestos fibers are dispersed through the coarser uniform fibers from

Yucca an excellent filter medium for gases is obtained.

F—MISCELLANEOUS EXTRACTIVES

The use of various xerophytic plants as stock feeds is generally well-known. This is particularly so in Texas where cattlemen managed to pull their herds through the drought-years by feeding them on *Opuntia* from which the spines had been burned. Mesquite gum, *Yuccas*, *Opuntias*, and greasewood have been utilized as soil conditioners. Waxes are obtainable from *Agaves*.

Any project designed for utilization of plants for the purposes outlined above must consider its economic aspects. In that section of the report dealing with this question, Mr. Cruse emphasizes such themes as processing facilities, plantation management, and the requisite machineries. However, he refers to several other facts which we, as cactophiles, consider interesting in the light of his preceding section. For instance: "Some of the extractives, particularly the saponin, appear to be formed as a result of a drought-resisting mechanism. Therefore, if attempts to hasten growth by heavy irrigation are made, the yield of desired extractives may decrease."

Mr. Cruse, in addition to being a chemist interested in the economic advantages of xerophytic plants, is also a conservationist. He made clear, in his discussion with us, that only those species and/or genera which propagate freely and easily could be considered as sources of extractives of any kind. Fortunately, this approach is not merely a matter of idealistic principle; it is a basic economic fact. For instance. Despite the fact that alkaloids are abundant in *Lophophora williamsi* (the peyote), this source could not be considered since the plant propagates only from seed, and is a slow grower; the rape of the natural habitat would be undesirable to the entrepreneur who can secure the same end product from other more economical xerophytic sources. A further case in point is the large number of *Agave* plantations which today, and for some time past, have been successful in Mexico.

The report by Mr. Cruse was the result of his having been waging, for some time, a struggle to have the Southwest Research Center embark on such an experimental program of cultivation and the obtaining of extractives.

Southwest Research Center was founded by Oilman Tom Slick, of Texas. Its initial program covered the field of basic research. However, in 1947 it was extended, and a second department added covering the field of what is known as contract research: that is, performing under contract research on specific problems at the request of industrialists who do not have laboratory facilities of their own. At the time of its origin,

this second department was devoted primarily to research of oil extractives and derivatives; by 1957, however, the department covered the complete field of industrial chemical research. In that same year, an Agricultural Institute, engaging in the many aspects of agricultural research, became the third department of the Center; and in 1958 a Bio-chemical Research Institute was inaugurated. Each of these four departments is administratively autonomous, with a co-ordinating board serving in an executive capacity.

Because of the enthusiasm with which Mr. Cruse's report was received by the Conference, Southwest Research has had a large number of copies of the report made up for distribution to the profession and interested industries. Anyone who might be interested in getting more detailed information on any of the matters referred to here will be able to secure a copy of the report, with its extremely comprehensive bibliography, by writing Mr. Robert Cruse, Associate Research Chemist, Southwest Research Center, 8500 Culebra Road, San Antonio, Texas.

ACTIVITIES OF THE NEW MEXICO CACTUS & SUCCULENT SOCIETY

NOVEMBER '58 - MARCH '59

The New Mexico Cactus & Succulent Society meeting for November '58 was held at the home of Luke and Betty Vortman. Our annual election of officers was held with the following results:

President: Mr. Luke Vortman

Vice President: Mr. Van Luhrs

Treasurer: Mr. Ed Nadolny

Secretary: Mrs. Mary Jane Abrams

Aff. Director: Mr. Prince Pierce, (2nd year)

After the election of officers and business meeting, the society held an auction of a large number of cactus plants very kindly donated to the society by Mrs. Eunice Bullington, of Deming, New Mexico. The bulk of fun and entertainment was provided when a group of plants were wrapped and auctioned to the members without their being able to see what they were buying. Some of the biggest bargains of the afternoon were large plants of *Echinopsis multiplex*, *Op. stanleyi*, several unknown *Echinocereus* seedlings two or three inches high, *Echinocereus blanckii*, *Mammillaria echinata*, *Coryphantha bumamma*, and a number of *Opuntias* of the *Basilares* group one of which is thought to be a white flowered *Opuntia*. Everyone spent the remaining part of the afternoon admiring the Vortman's outdoor collections of native cactus. Their beautiful and well protected garden and patio accommodate most New Mexico species, many of which usually do not thrive except in the southern parts of New Mexico. They have successfully brought two *Peniocereus greggii* through the coldest winter ever recorded in Albuquerque, WITHOUT benefit of even a cold frame!

Mrs. Dorothy Miller was hostess to our society January 16. After the business meeting Luke Vortman presented an introduction to his study of succulent plants. He is studying each family, one by one, in the University of New Mexico Library, looking for succulent members, recording them, and preparing the information for later presentation to our society in a manner understandable to the average person. He has

since admitted that he has discovered that he "has a tiger by the tail!" Later Prince Pierce showed slides sent to him by Mr. Lamb of Worthing, England. The pictures were taken of habitats and plants growing in the Canary Islands. *Euphorbia canariensis*, *E. aphylla*, *E. beaumeriana*, *Kleinia antephorbia*, *K. nerifolia*, and *Huernia confusa* were represented. A flowering *Hoodia bainii* (not a Canary Is. plant) interested many members. One slide was withheld and shown later, mixed in with a group of slides of *Opuntias* in habitat in Texas and New Mexico. When asked to identify the area shown on the screen, everyone suggested areas in Texas or New Mexico. One person thought they recognized a spot in our own Sandia Mountains just east of Albuquerque! It caused quite a furor when they learned that the scene was one in the Canary Islands! The *Opuntia dillenii* fooled everyone since it resembles *Opuntia engelmannii*. Only the *Euphorbia canariensis* in the background convinced them they were wrong! Pictures of *Pediocactus? paradinii* and *Toumeyia* (Navajoa) pee-

blesiana in flower interested everyone. Some cacti native to New Mexico shown in habitat and in flower were: *Mammillaria meacantha*, *Pediocactus simpsonii*, *Coryphantha arizonica*, *Coryphantha neomexicana*, *Mammillaria microcarpa*, *Echinocactus horizonthalonius*, *Echinocereus dasyacanthus*, *Echinocereus fendleri*, *Escobaria tuberculosa*, and *Colorado mesa verde*.

A field trip to Dog Canyon, south of Alamogordo, N.M., the Cornudas foothills, and El Paso, Texas, brought out quite a gathering on February 21, 22 and 23. Ed Nadolny, Al and Ann Chabai, Byron and Doris Murphey, their daughters Kathleen and Patty, Paul and Mary Jan Abrams, Luke and Betty Vortman, Ann Sherman, and Mr. and Mrs. Louis Chabai of Butte, Montana, all decided to take the trip. The plant judged to be the most interesting plant was found in the Cornudas foothills by Ann Sherman. It turned out to be an *Echinocereus viridiflorus* with extremely long centrals, which spiraled clockwise about the plant. We of New Mexico are not accustomed to

Continued on page 93

Partial Self-sterility of the Barrel Cactus

BY S. E. MCGREGOR AND STANLEY M. ALCORN¹

The barrel cactus, *Ferocactus wislizeni* (Engelm.) Britt. & Rose, "occurs in western Texas, southern New Mexico, Arizona, and northern Mexico to altitudes of at least 4,500 feet. It has diurnal flowers lasting several days." (Kearney, Thomas H., and Robert H. Peebles, U.S.D.A. Misc. Publ. 423, p. 599, 1942). It is occasionally used in the Southwest as an ornamental plant. In 1958 observations were made on barrel cactus plants at Tucson, Arizona. The flowering, fruiting habits, and seed production, as influenced by visitation by pollinating insects, were studied.

Five plants selected at random were covered with 12-mesh plastic screen cages just prior to flowering, and seven were left uncaged as controls. Buds ready to open were tagged to determine the duration of flowering of each, the number that failed to produce fruit, and the number that matured fruit. Seed counts were made on a random sample of five fruit from each plant.

The color of the flowers on the different plants varied from amber to deep crimson. Records on 34 individual flowers showed that they opened about 9 a.m. and closed around 5 p.m. Some of them opened on 2 successive days while others opened each day up to 5 days. The largest percentage were open 4 days (Table 1). In contrast, the flowers of saguaro, *Carnegiea gigantea* (Engelm.) Britt & Rose, open about midnight and close late the next afternoon; they do not open again (Peebles, R. H.

and H. Parker, Desert Plant Life 18:55, 1946).

Table 1.—Number of days individual flowers were open on caged and uncaged barrel cacti.

DAYS	NUMBER OF FLOWERS	
	CAGED	UNCAGED
2	1	1
3	4	6
4	6	13
5	2	1

Usually during the first day the flower was open the stamens were straight and rather tightly compressed against the style, and the lobes of the stigma closed. On the following days the stamens were frequently curved outward so that at least some of the anthers touched the petals, and the lobes of the stigma were spread. No difference was observed between caged and uncaged flowers. The latter were frequently visited by unidentified species of wild bees. Tiny bees were also seen passing through the screen and collecting pollen from the caged flowers. Some pollen may have been transferred by them to other caged flowers.

Of 91 flowers formed on 7 uncaged plants 83 set, with an average of 409 seeds per fruit. Only 54 set fruit of 109 flowers on 5 caged plants with an average of only 114 seeds. This reduction in fruit set and seed per fruit was significant statistically.

Complete self-sterility may have existed but, if so, was masked by the pollination effected by the small bees passing through the screen. The test showed, therefore, that fruit and seed production was materially decreased by excluding the larger bees, and that self-perpetuation may be entirely dependent on visitation by pollinating insects.

¹Entomology Research Division and Crops Research Division, respectively, Agr. Res. Serv., USDA, Tucson, Ariz.

ROUND ROBIN NOTES

If any of you are interested in joining one or more of these Round Robins, let me give you a whirl through some of them now, circulating among the members of our Cactus and Succulent Society and listening to what they have to say.

Beginning with the Hybridizer's Robin, Glenn Webb writes, "I must confess I still have to follow the procedure of opportune crossing rather than more planned crosses. However, unless we are able to work with thousands of plants, very scientific methods are not readily followed. Mastery of handling pollen is essential, so I am saving every scrap of pollen using gelatin capsules, and recording day it was taken and source, and try using it on another plant of the same species. I seldom have any blossom activity until February, but I use this time to give seeds an early try out. The art of growing successfully from seed is also an intrinsic part of hybridizing as well as the use of grafts to speed up the growth of seedlings. Everyone should find methods of grafting which will work for him." Marvin Tooley says that in spite of the fact "I have been forced to try any two plants that happen to be blooming at the same time, I have discovered some things this way. My tests tend to indicate that *Hylocereus* and *Eriocereus* will not cross. *Cereus* and *Acanthocereus* crosses were unsuccessful. *Eriocereus* and *Epiphyllum* were successful(?), *Pseudorhipsalis micrantha* x *Epiphyllum* successful".

From the Small Cacti and Mimicry Succulents Robin Doreen Murphy remarked, "Flowers have been good this year despite the appalling weather. I read somewhere that this was considered the possible result of good weather last year ripening the plants thoroughly. What say you folks to that? If this is so looks as if next year should be a big disappointment." Speaking of her plants she said, "I have a superb crest of *Mammillaria bocasana* and a *Notocactus scopae*. Also I got *Lophocereus schottii*, *obesa* and *meckleyanus monstrosa* forms, a beauty of each about ten inches high". Bruce Cutler suggests in regard to crests, "I have several and find the normal growth seems to grow more rapidly and so can soon swamp the crest. I always cut it off, but find it is safer to root it and grow it on because you sometimes find it will develop a crest".

In the International *Mammillaria* Robin the question of whether to grow plants in beds rather than pots brought out these opinions. Marion Turnock wrote, "In the spring I have intentions of potting up all my plants, at present planted directly in a compost bed. They will be sunk in sand in pots. The bed seemed a good idea at first because it gave a good root run, but now I find root mealy is not so easy to get rid of. Uprooting overgrown plants means disturbing several in the vicinity owing to reach of roots. The back side of the plant is always the place where mealy bug thrives! Difficult to get at, so I am doing some reorganization." Harry Barwick remarked, "In regard to putting plants directly in beds or even plunging the pots in sand, I have seen too many collections infected with root meales and worse—root nematode. In the case of the latter it is necessary to cut away all roots and then re-root." His program for caring for his plants is interesting. Perhaps you would like to know what it is. He says, "These things I do—water only when needed, keep water off plants, fertilize, spray regularly, study light conditions and those needed for a particular plant." He adds, "I find Malathion best for control of mealy bugs, red spider and scale. I should spray every 1st and 15th of

the month especially the warmer months. My local cactus friends remark on the cleanness of my cacti, which sure gives me a lift."

In the *Euphorbia* Robin No. 2 Lucia Kres covers several phases of these plants, from fertilizing to photography with a very special camera "where we are able to get a shot of an *E. obesa* or *E. valida* alone, which allows us to see the inside of the flower and to observe things which can't be seen with the naked eye". The camera gives clear and well magnified pictures. "Since this is the first year our *Euphorbias* have been under glass we are obtaining blooms that we never had before," she says. "One of the things that interests us tremendously is the sex angle. *Euphorbias* do not have perfect flowers: a male and female organ in the same flower. Such species as *obesa* and *valida* are dioecious and both male and female plant must be in flower in order to propagate. We are seeing a large number of our monoecious plants in bloom. It is fascinating. In a flower cluster, one flower blooms; not until that flower is dead do the rest of the cluster bloom. The first has been female and the balance male. For propagation purposes more than one plant is required since it is impossible for the female to be fertilized by the male in the cluster."

Just a note or two from the Decorator's Robin, which needs several members incidentally. Norma Lee Cole says, "I arrange for pure enjoyment." At that time of her letter she was pleased with an arrangement of "a tall white taper, three *Sansevieria* leaves and three *Echeverias* at the bottom to hide my holder. I especially like succulents because of their lasting quality." In Alta Tarango's letter mention of two arrangements hardly can begin to give an idea of their beauty when she wrote, "One was a big yellow sea fan with some shells and a succulent, which looked like a sea anemone, at the base." The succulent she said later was *Stylorrhynchium viscidum*, a native of Catalina Island and peculiar to the California sea-coast. "The other arrangement," she wrote, "had some tall, highly colored stalks off my *Orchid Cactus* with some other highly colored *Echeverias*. It caused a lot of approval from viewers."

Skipping around to a number of Robins which have individual plants discussed, one called *Maihueunia* was remarked upon by Ruby Elrod who said, "I believe it is an *Opuntia*, common name 'Mustard Leaf.' I have one pot full, about two feet wide and two or more feet high. It has never bloomed and it is about ten years old." From this same Window Sill Robin, Agnes Hirshinger speaks about one of her favorite *Mammillarias*: "*M. mendeliana* is blooming, having surprised me exceedingly by budding in late December. It produced a full double circle of buds—every axil crowded—and has been opening any where from just one, to four or five, lovely pink, wide-awake flowers every day since mid January. This plant has had no water since early in November except about twice since the buds appeared when it was dipped briefly (for a count of ten) into warm water about halfway up the sides of the pot. This particular Mam. is very attractive." Edith Bestard, in C. & S. Robin No. 1, mentions "my beautiful *Gymnocalcium denudatum*—with gray appressed spines that look exactly like spiders," and goes on to say about another plant she likes too, "*Crassula arborescens* is a beauty. I had one once and it was the prettiest succulent I owned. Mine had sort of grayish-green leaves, red edged, and the whole leaf had a sort of pigskin dot appearance." From the first round of C. & S. Robin No. 10, Dorothy Carr says, "For a year I had only three of four cacti, and then I saw a small *Mammillaria* with a ring of red blossoms in a greenhouse. That was ten years ago and that same *Mammillaria* still has its ring of blos-

soms, and is 22" above the pot with a wooden fence around it to keep it from uprooting itself." From C. & S. Robin No. 6, Aileen Campbell writes, "I have been thinking I should get some plants that bloom in the winter, like some Neoporteria, to add some winter color to my collection." In reply, Mildred Wellbaum wrote, "You will love the Neoporteria," mentioning a dozen species and singling out one, *N. castanoides*, to say, "It has been in bloom since November. I bot these for winter bloom." Although Irma Huch mentions interesting plants in her letter of this Robin, I thought her idea useful when she said, "I have made me a miniature hothouse with a large aquarium. I put a piece of clear plastic over the top. If it needs air I just fold the corner back." She was rooting a number of plants in it.

The new Epiphyllum Robin has made its first round and in it Lois Covey writes, "Since I have no beautiful large live oak tree with hanging branches for epiphytes, I had to build a substitute—a lath-house 12' x 24', with lath on the top and south side and both ends. Vines growing up on the outside, all giving a wonderful filtered shade. In this I grow all sorts of shade-loving plants—Bromeliads, some orchids and an endless variety of foliage plants, and for

several years have been trying out the various shade-loving cacti with fine results."

Now to the business of our Robins. I have a request for a Propagation Robin, which would include seed grafting. If this sounds like something you would enjoy please let me know that I may put your name on the list. One more member is needed from this country for International Robin No. 5. A new Robin on Echeverias will be in flight shortly and if there is anyone especially interested in these beautiful plants there will be room for several in it. A number of Robins are still on my waiting list for more members among them the Stapelia Robin, Opuntia Robin, the Tree-Type Cactus Robin. Of course anyone who wishes a Cactus and Succulent Robin or another group on Euphorbias, or other special Robin, may ask for it. It sometimes takes a while to collect enough members to make it ready for flight but if you have patience perhaps it will become an actuality. Special Robins are apt to take longer to form than the general subject ones. Whatever you choose, I send you a cordial invitation and will try to find a place for you, given time.

Gladys Panis, Box 705, Falmouth, Mass.

CULTIVATED AND NATIVE AGAVES IN THE SOUTHWESTERN UNITED STATES

AUGUST J. BREITUNG

PART 2

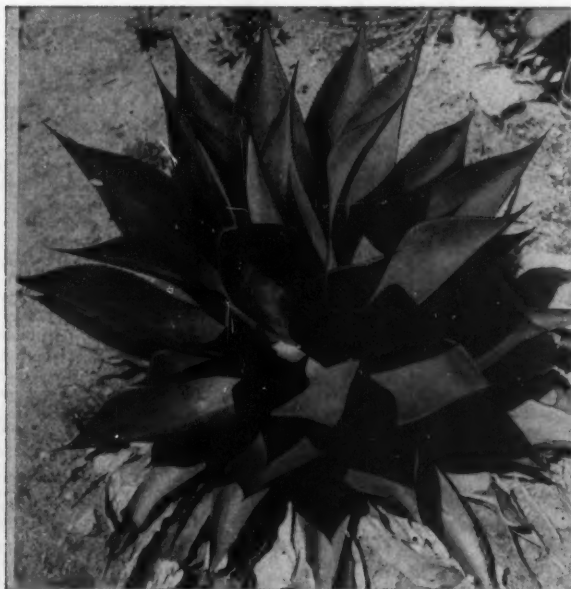


FIG. 44

Agave micracantha

Grown by F. Crosby, Malibu, California. Approx. 1/9 natural size. This is an offset shown on top of this Journal, page 48, Vol. 31, No. 2. According to Berger in *Die Agaven*, page 59, the plant coincides with the description of *Agave chloracantha*. However, Trelease in Standley, *Trees and Shrubs of Mexico*, Cont. U.S. Nat. Herb. 23(1): 135, 1920, includes this and several other closely allied forms as synonyms of *A. micracantha*.

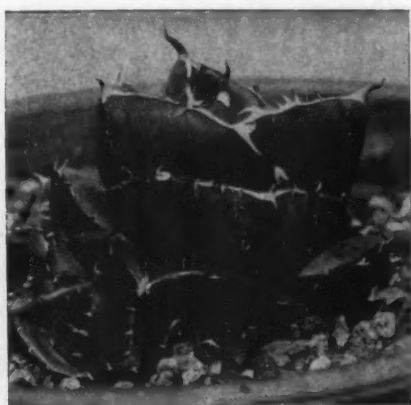


FIG. 45
Agave pumila

Photograph by the Missouri Botanic Garden in 1909; negative No. 50-06-15. Approx. natural size.

Section 2. PERICAMTAGAVE Berger¹

Agave pumila De Smet ex Baker, Amaryllidaceae 172, 1888².

Distribution: unknown.

Rosette very small, scarcely 5 cm. in diameter and 3 cm. high; leaves 5 to 8, grayish-green, fleshy, concave above, rounded and dark-lined beneath, abruptly contracted into a short, soft, whitish spine and few small recurved teeth connected by a whitish margin.

Agave lecheguilla Torrey, Bot. Mex. Bound. 213, April 1859.

A. poselgeri Salm-Dyck, Bonplandia 7: 92, April 1859.

A. lophantha var. *poselgeri* (Salm-Dyck) Berger, Die Agaven 93, 1915.

A. lophantha var. *pallida* Berger, Die Agaven 93, 1915.

Distribution: Texas, Coahuila, Chihuahua and Zacatecas; type locality, near Del Rio and along Devils River, western Texas.

Rosette 75 cm. in diameter and 45 cm. high, stolons numerous, eventually producing colonies up to 50 square meters in area; leaves falcately ascending, green or bluish, 20 to 35 cm. long, 2.5 to 3.5 cm. wide, upper surface with scarcely evident stripe, back with narrow green lines; spine 1.5 to 2 cm. long, brown, soon gray, sides decurrent with the straight detachable horny borders about 1 mm. wide; teeth gently recurved 3 to 5 mm. long, 1 to 2 cm. apart; inflorescence 4 to 5 m. high, slightly bent. Flowers June-July.

Agave glomeruliflora (Engelmann) Berger, Hort. Mortol. 12, 1912.

Agave heteracantha forma *glomeruliflora* Engelmann, Gard. Cron. II. 19: 48, 1883.

Agave lecheguilla forma *glomeruliflora* (Engelmann) Trelease, Cont. U.S. Nat. Herb. 23(1): 136, 1920.

Agave chisosensis Muller, Amer. Midl. Nat. 21(3): 763-765, 1939.

Distribution: Texas and Coahuila; type locality, Guadalupe Mts. in western Texas.

Rosette up to 1 m. in diameter; leaves fleshy, narrowly ovate-lanceolate, glaucous green, smooth with few and scarcely evident dark lines on back surface, 30 to 60 cm. long, 4 to 8 cm. broad; spine 2.5 to 5 cm. long, 5 mm. broad at base, dark brown, glaucous, becoming grayish, sides decurrent with the horny margins; teeth 6 to 13 mm. long, strongly appressed retroflexed, 3 to 5 cm. apart, the basal teeth smaller and close set; inflorescence 5 to 6 m. high, very strict, flowers in short compact glomerules on branches 4 to 6 cm. long forming a narrow panicle rather than a spike.

¹In the previous issue of this journal, page 45, between lines 14 and 15, add: Section 1. ANA-CAMPTAGAVE Berger.

²No living specimen has been seen by the author to date, but included here because other species have sometimes been mistaken for *Agave pumila*. Should any readers have living plants of this species, please advise the writer.

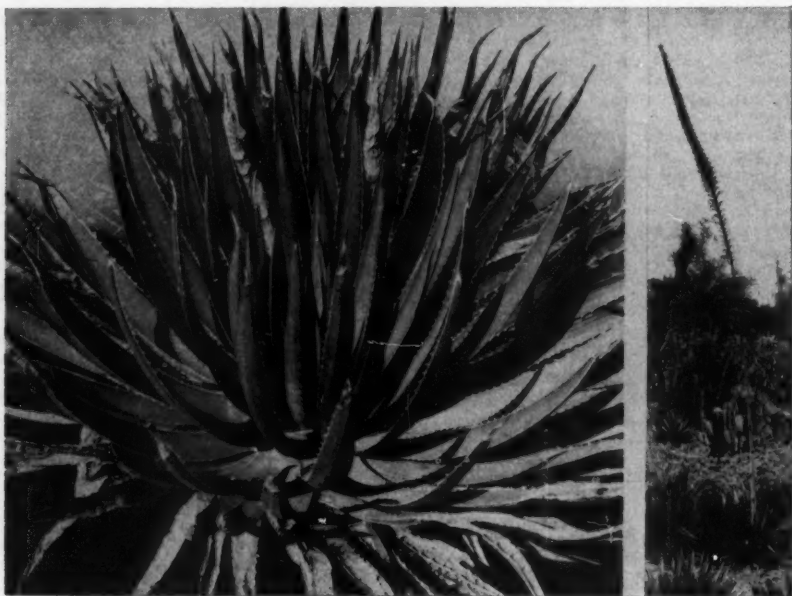


FIG. 46

Agave lecheguilla

Grown in the Huntington Botanic Garden, San Marino, California. Rosette approx. 1/8 natural size.

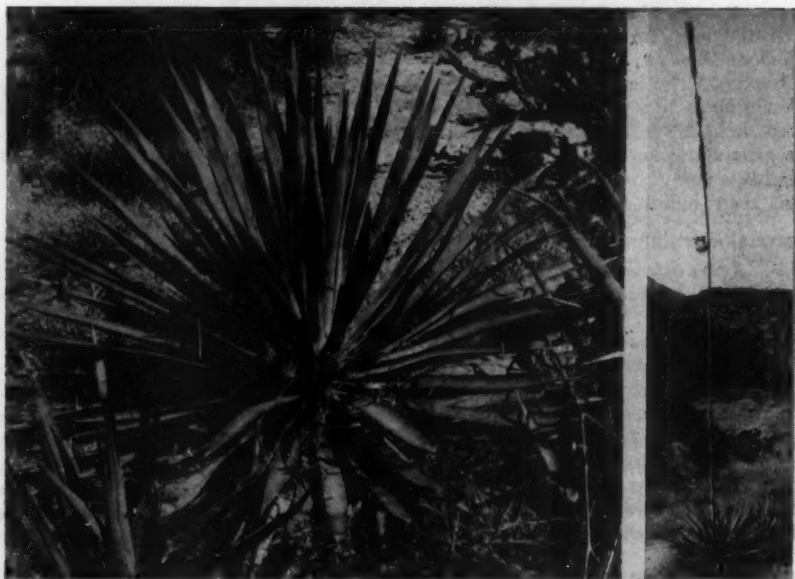


FIG. 47

Agave funkiana

Grown by Boyce-Thompson Southwestern Arboretum, Superior, Arizona. Rosette approx. 1/12 nat. size.

Agave funkiana Koch & Bouché, Wochenschr. Ver. Beford, Gartenb. 3: 47, 1880.

Distribution: Nuevo Leon and Tamaulipas; type cultivated in Europe without citation of locality.

Rosette 1 m. or more in diameter and 100 cm. high, stoloniferous; leaves scarcely falcate, green or glaucous with pale central stripe above and narrow dark lines beneath, 60 to 80 cm. long and 3 to 4 cm. broad; spine brown at first becoming gray, 15 mm. long; teeth 2 to 5 cm. apart, 3 to 6 mm. long, broad based, recurved, joined by a nearly straight detachable horny border 1 mm. wide; inflorescence 7 to 10 m. high. Flowers June-July.

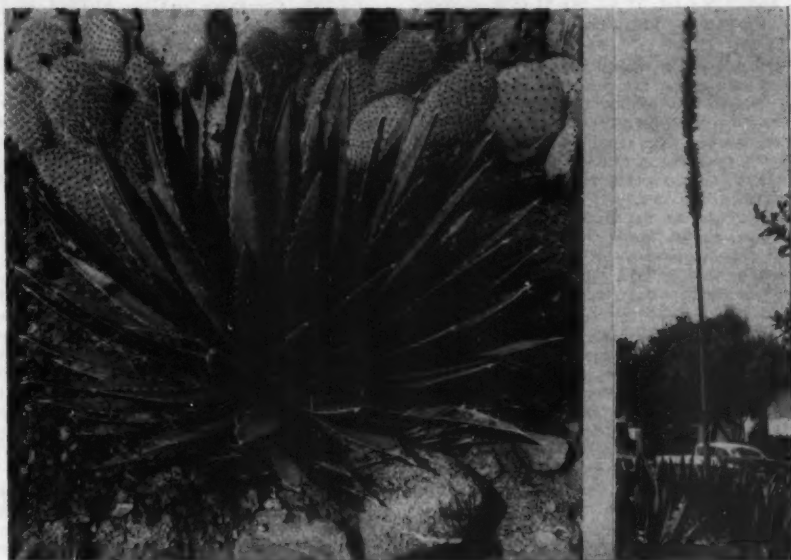


FIG. 48

Agave univittata

Left: rosette grown by George Glade, Tujunga, California. Approx. 1/8 natural size. Right: grown in the late F. Bullard's desert collection, Santa Monica Blvd., Beverly Hills, California.

Agave univittata Haworth, Philos. Mag. 10: 415, 1831.

Agave lophantha Schiede ex Kunth, Enum. 5: 838, 1850.

Distribution: Coahuila and Veracruz; type locality, Malpais de Naulingo.

Rosette to 85 cm. across and 45 cm. high, stoloniferous; leaves uniformly spreading, clear green often with pale ventral stripe and dark dorsal lines, 20 to 30 cm. long and 3 to 4 cm. broad; spine brown soon becoming gray, 10 to 15 mm. long, decurrent into the continuous horny leaf margin .05 mm. wide; teeth narrowly triangular, variously curved, unequal, 3 to 7 mm. long and 20 to 30 mm. apart; inflorescence 4 m. high, strict. Flowers June.

NEW MEXICO SOCIETY — Continued

such long central spines on *E. viridiflorus*, since most plants of this species either lack centrals entirely or have very short ones. Thus there was speculation that we might have a hybrid until Ann found a picture and description in Texas Cacti which dispelled all doubt from her mind. Ann Chabai was most impressed by *Mammillaria microcarpa* which she found growing in cracks of the rock, high on the cliffs above Dog Canyon. *Echinocereus stramineus* were the

most numerous plants represented and *Echinocactus horizontalis* was a close second. A few *Escobaria tuberculosa* were found on the cliffs, and a very few very beautiful *Mammillaria lasiocantha* var. *denudata* were found which were a soft baby pink in spine color. Some *Coryphantha macromeris* were located. They visited John Leasure's "Cactus Acres" in El Paso before returning to Albuquerque.

To be continued

MAY-JUNE 1959 OFFERING OF PLANTS
BY THE INTERNATIONAL SUCCULENT INSTITUTE, INC.

Please address all communications to the Secretary, J. W. Dodson,
921 Murchison Dr., Millbrae, Calif.

ISI-155 *Echeveria pososina* Walther. Allied to *E. elegans*, this species is notable for its exceptionally beautiful rosettes, the thick, incurved leaves having an alabaster-like color and translucency, which in winter take on a purplish tinge. See photo in this journal, Nov. 1935, pg. 71 UCBG 51.1356, collector and locality unknown, determined by Walther as this species. \$1.50

ISI-174 *Sedum bintonii* Clausen. A most untypical *Sedum* with dense, fuzzy rosettes reminiscent of *Echeveria setosa*. The delicate pale green leaves are thickly covered with white hairs, giving the plant a very charming appearance, especially when it is grown in rather strong light. A member of the *Sedastrum* group, it forms clumps and is slow-growing; as soon as its white-flowered inflorescences are dried they should be pruned to the base to retain compact growth. When grown inside, water should not be allowed to remain between the leaves. See photo in this journal, July-Aug. 1953, pg. 97. UCBG 53.411, collector and locality unknown, received from F. Schmolli, \$1.25

ISI-241 *Orostachys aggregatus* (Makino) Hara. In the growing season this member of the *Crassulaceae* forms masses of rosettes, resembling green roses, which in the fall produce spires of white flowers. In the winter dormant season (when watering should be lessened) the plant is hidden under its dried leaves, but it does not form specialized, dormant leaves as in *O. japonicus*, which was offered in our last list. A most attractive species, now available for the first time. UCBG 55.730, collected Aug. 1955 by Reid Moran (#5263) at Cape Erimo, Hidaka, Hokkaido, Japan. \$1.00

ISI-295 *Sedum moranense* HBK. An excellent ground-cover for rockeries, where it hugs the ground and never becomes weedy. The tiny green, red-tinged leaves are so dense as to hide the stems. Unlike some *Sedums* this species does not lose its compact habit when in flower. UCBG 58.497, collected by Reid Moran (#6309) on limestone, 3 miles north of Puerto Flores, Coahuila, Mexico, 1900 meters, Nov. 8, 1958. \$.75

ISI-298 *Echeveria turgida* Rose. A small, waxy looking rosette, pale blue-grey in color with each incurved leaf tip coming to a sharp red-tipped point. Such species are desirable for their clustering habit and because they remain low and do not spread rapidly. UCBG 50.688, collector and locality unknown, determined by Walther as this species. \$1.00

ISI-299 *Haworthia berrei* var. *depauperata* Poelln. *H. berrei* belongs to section *Coarctatae* and resembles *H. armstrongii*, with upright stems and stiff, bluish leaves; this variety is less tubercled than the type, and makes a fine specimen when well grown. This species does best in a rather shaded position, when the glaucous-blue coloring is more pronounced. Stellenbosch 6642, collected at the Sondags River, between Steytleville and Port Elizabeth, South Africa. \$1.25

ISI-301 *Ceropegia radicans* var. *smithii* (Hend.) Huber. This is a rare and very distinct variety of the well-known *C. radicans*, differing in its shorter and much wider corolla lobes. The flowers are decidedly weird, with a maroon-blotched tube and bright green lobes forming a cage-like structure. An easily grown vine for the greenhouse or window-sill. Our plants

are from the type material collected by G. G. Smith (#5318) on the Kweleghe River, about 30 miles N.E. of East London, South Africa, growing under bushes on south-facing slopes (this is the only known locality for this variety). \$1.50

ISI-302 *Ceropegia ampliata* Mey. A totally different *Ceropegia*, whose uninteresting, leafless, rambling stems are in great contrast to its amazing flowers. These are quite large and shaped like a dirigible balloon, with an inflated base and a partially opened apex; the interior is heavily hirsute and an efficient insect trap to insure pollination. The flowers tend to abort from sudden or extreme changes of temperature, but usually appear in large numbers. UCBG 51.1279, collected by E. A. Pienaar, Sept. 1951, at Mupa, a sawmill near Inhaminga, 116 miles North of Beira, Mozambique, growing profusely on a large ant-hill on rocky outcrops along the river. \$1.50

ISI-303 *Rebutia pygmaea* (Fries) Britt. & Rose. *Rebutias* are always popular plants because of their small stems and profuse, colorful flowers. This is one of the older species, but it has seldom been offered. It forms tuberous roots, large clusters of egg-shaped stems and bright red-orange flowers. Our plants are rooted cuttings from a plant collected March 13, 1936 by James West (#6225) near Huanahuaca, Quebrada de Celato, Jujuy, Argentina, on outcrops of slate rock in protected crevices, 3600 meters, with xerophytic ferns and *Peperomias*; UCBG 36.1726. Rare. \$1.50

ISI-304 *Rebutia steinbachii* Werd. In the high Bolivian Andes this extremely rare *Rebutia* is completely covered with long black spines, but in cultivation the spines become much less conspicuous. The stems are blackish green with grooved podaria genus, *Sulcorebutia*; the numerous flowers are a vivid purple-red. Grafted and grown outdoors it soon makes a showy specimen, but it also is a very satisfactory pot-plant on its own roots. UCBG 54.1135, collected in May 1954 by M. Cardenas (#5011), Cochabamba, Chapare, Colomi, Bolivia, 3400 meters (probably the type locality, according to Cardenas). \$1.75

ISI-305 *Crassula* 'Jade Necklace.' This new hybrid should prove to be not only an outstanding plant in a collection but a popular plant for dish-gardens and rockeries as well. Its stems are densely clothed with jade-green, red-edged leaves and become capped by masses of large pinkish white flowers. A description and photo were presented in this journal, Jan.-Feb. 1959. Rooted cuttings from the original clone are now offered for the first time. Patent to be applied for. \$1.75

GUGGENHEIM FELLOWSHIP

A Guggenheim Fellowship has been awarded to Paul C. Hutchison, Senior Botanist, University of California Botanical Garden, Berkeley, to pursue his studies of the cacti of Peru. Hutchison visited Peru in 1952 and again in 1957 and has traveled over 12,000 miles in that country, largely by surface routes. The 1957 expedition was largely devoted to an intensive study in the field of Peruvian cacti in anticipation of preparation of a monograph to be published by the Chicago Natural History Museum in conjunction with J. Francis Macbride's "Flora of Peru." The

Fellowship will permit an extension of his studies to herbaria of the eastern U. S. and Europe, as well as to living material cultivated in Europe, and will cover the period July 1, 1959 through June 30, 1960. Hutchison plans to leave for Europe on July 1 and

expects to be there at least six months. The last portion of the allotted time will be spent in Berkeley, where, at the University of California Botanical Garden, over 1,000 collected plants of Peruvian cacti are now being grown.



SPINE

CHATS

LADISLAUS CUTAK



The cactus convention is near at hand. Have you made your reservations yet? Better do so immediately. Don't put off what you can do today. We all feel this convention will be one of the outstanding events in your life!

Beautiful Holiday Inn will be our headquarters for three full days, July 8, 9 and 10, but of course you can stay as long as you want, especially if you wish to see the sights in the St. Louis area. Did you write to the Missouri Division of Resources and Development at Jefferson City, Mo., for your free literature on our scenic state? All of Missouri is highly scenic as well as historic.

There are world famous springs, caves and other attractions within one to three hours' drive out of St. Louis. To the north is the Mark Twain region centered around Hannibal. This was the playground of the mischievous and adventurous Tom Sawyer, Huckleberry Finn and Becky Thatcher. There you'll see the whitewashed fence, the cave with its labyrinthian passages, and the island in the Mississippi, scene of Tom and Huck's pirate forays. Mark Twain's home is preserved as a museum and contains memorabilia of his days. On your way to the Mark Twain country you first pass through the Daniel Boone region along the north bank of the Missouri River where America's most famous pioneer and frontiersman spent the last twenty years of his life. Near Defiance will be found the Daniel Boone Shrine—recently opened to the public.

To the southwest of St. Louis is the famed Meramec Valley—land of rivers, springs and caves. Probably the most popular attraction is Meramec Caverns, 55 miles distant from St. Louis, where unusually large onyx formations abound. Thirty miles farther is Onondaga Cave near Leasburg—the only cave entered by a thrilling boat ride. To the south of St. Louis is the Old Settlement region—the first cradle of white man's civilization west of the Mississippi. Here at historic St. Genevieve one can see many old buildings dating back to 1785. The town is old and quaint and perpetuates many of the customs and traditions of its founders. A little farther on is the beautiful Arcadia Valley, only 100 miles below St. Louis. On its northern fringe one will witness huge granite boulders and an endless chain of granite hills. At Graniteville wind and rain have carved the huge granite boulders into the semblance of tremendous elephants and are aptly called Elephant Rocks. The whole region abounds in natural wonders. A peculiar feature are the Shutins, deep ravines coured by frothing streams and presenting pictures of wild beauty. In this region is Tom Sauk Mountain, the highest point in Missouri and on one of its sides the beautiful Mina Sauk Falls cascade to a granite ledge 200 feet below. During the dry season the falls are reduced to a mere trickle but limpid pools are always present in the granite de-

pressions. The Old Settlement area is rich in scenic attractions and is one of my favorite places for weekend drives.

Beyond the hundred mile perimeter of St. Louis are other areas providing natural settings of incomparable beauty. Near Van Buren is located Big Spring which is generally considered to be the largest single freshwater spring in the world, with a maximum daily flow of 846,000,000 gallons. Other springs of first magnitude are located in southern Missouri with many more smaller ones violently and noisily issuing less volume in hydrant-like fashion. Then there is the Lake of the Ozarks region south of Jefferson City. The vast man-made lake twists and curls like a huge dragon through miles of wooded terrain. There are 1300 miles of shoreline and many recreational facilities associated with it. Missouri is truly a state of variety. Whether you travel east or west, north or south you will be amply rewarded with scenic grandeur in the Show Me State. By all means be sure to bring your camera and lots of films.

Now getting back to the convention activities: there will be three full days of brimful excitement. Most of the speakers are already lined up. Dr. Frits Went, director of the Missouri Botanical Garden, will welcome you and give an exciting talk on the Physiology of Desert Plants. W. Hubert Earle, director of the Desert Botanical Garden in Phoenix, will tell us all about plants and activities at that famous garden. Dr. Norman Boke of the University of Oklahoma will deliver a semi-technical discourse and the Moortens of Palm Springs will regale us with their exploits in Mexico. All of the talks, of course, will be illustrated with wonderful color slides. Some will be on loan from various parts of the world, such as Edgar and Brian Lamb's from their Exotic Collection in England and George Glade will present "Aloes of South Africa." I will also be on the program and there will be others. The final program will be handed you at the registration desk.

On the fourth day (Saturday, July 11) we want all of you folks to visit the Missouri Botanical Garden where a gigantic cactus show will be in progress. Buses will be hired to take the members to the Garden for a leisurely visit, giving the members ample time to view the exhibits and photograph to their heart's content. We will probably arrange a box lunch for you or perhaps go to a nearby restaurant. In the evening we are planning a "Meet the Cast" party at the world famous Municipal Opera in Forest Park where "Rio Rita" will be performed by a stellar cast. This party begins at 6:30 p.m. with a guided tour of the gigantic stage. You will see how the stage hands set up scenery, you will meet the cast and then have a box lunch right on the stage. The regular performance begins at 8:30 p.m. Since it will be still bright during the party (we will be on daylight saving time)

you can shoot pictures all you want. Doesn't this sound exciting? There is nothing like our open-air theater anywhere in the world. The outdoor theater seats well over 10,000 and you can see and hear wonderfully from any seat. The box lunch at the theater will be \$1.35 and the seats range 75c, \$1.25, \$2.00, \$2.75 and \$3.50 for box seats. You can choose any seat in the above category or we can arrange one set price and reserve a section for the entire group. Those of you who are interested in the post convention tour (July 11) of the Garden and the Municipal Opera can contact me right away and I'll have the cost for you by return mail. Write me at 2315 Tower Grove Ave., St. Louis 10, Mo.

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